5.0 Water Use and Water Quality

5.1 Water Use

Local water use is very much what would be expected in a rural setting; namely, livestock and crop watering. However, other important and beneficial uses include energy development (oil, gas and uranium). Because this part of Goliad County does not have a diversified industrial presence or a built-up area (urban environment), water uses associated with these activities are absent. Other water uses within a 5 mile radius such as major municipal supply wells, schools, medical facilities, etc. also are absent. The nearest major public water uses are located in Cuero (approximately 18 miles north of the project area), Goliad (13 miles south of UEC's site) and Victoria (approximately 22 miles east of the site).

5.2 Local Water Quality

Water quality was established by sampling a large number of water wells. Sampling was conducted for all of the wells within the proposed permit area boundary and nearly all of the known wells within 1 km of the permit boundary. In addition, UEC completed 20 baseline wells within the permit boundary (see Figure 5.1 Baseline Wells in the Map Appendix). Not including the 20 baseline wells completed by UEC, a total of 47 wells were sampled for 28 water quality constituents. As a result of this sampling effort, local water quality is now firmly established. Table 5.1 provides the analytical results for each individual well and Table 5.2 gives a statistical summary of each water quality constituent. Table 5.2 also compares minimum, maximum and average values to U.S. EPA Drinking Water Standards.

A review of Table 5.1 shows that the area generally has good water quality. However, some constituents in several wells are elevated above the average for all the wells, and in some instances certain constituents are in excess of EPA Drinking Water Standards. It should be noted that because groundwater quality varies according to natural mineral content, there is nothing unusual about the elevated parameters in a few wells.

Table 5.1 Water Quality in Area Wells

	Jacob 1	Jacob 2	J. Bluntzer 1	Rutherford 1	Rutherford 2	Wesselman 1	Cheek 1	Cheek 2
Ca	145	125	80	123	103	100	108	108
Mg	16.0	13.0	17.0	13.0	15.0	9.3	18.0	18.0
Na	195	183	79	83	69	38	96	95
K	3.2	2.7	3.1	1.8	2.2	2.2	3.1	3.0
CO3	0	0	0	0	0	0	0	0
HCO3	411	447	334	458	388	331	305	306
SO4	118	78	21	26	8	18	41	43
Cl	258	193	99	101	106	59	183	179
NO3-N	7.40	11.00	0.54	0.39	0.06	0.70	1.70	1.60
F	0.62	0.97	0.62	0.43	0.42	0.23	0.65	0.65
SiO2	58	72	28	58	45	39	42	41
TDS	1020	910	485	620	538	397	648	653
EC µmhos	1680	1420	855	1020	910	711	1130	1120
ALK	337	366	274	375	318	271	250	251
pH	7.19	7.52	7.35	7.03	7.23	7.20	7.15	7.18
As	0.016	0.016	0.001	0.005	0.003	0.001	0.002	0.003
Cd	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	0.0001
Fe	0.01	0.02	<0.01	0.01	<0.01	0.02	<0.01	<0.01
Pb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Mn	<0.01	0.01	<0.01	<0.01	0.24	0.01	<0.01	<0.01
Hg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Mo	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Se	0.004	0.003	0.001	<0.001	<0.002	<0.001	0.002	0.002
U	0.002	0.002	0.009	<0.001	<0.001	<0.001	0.001	0.001
Ammonia	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ra-226 pCi/l	0.6+/-0.1	0.2+/-0.1	0.6+/-0.1	0.2+/-0.1	0.3+/-0.1	0.3+/-0.1	0.4+/-0.1	2.0+/-0.1
Alpha pCi/l	15.0+/-6.0	27.0+/-7.0	15.0+/-4.0	11.0+/-4.0	11.0+/-4.0	6.8+/-2.7	14.0+/-5.0	8.8+/-4.1
Beta pCi/l	15.0+/-3.0	8.7+/-2.7	12.0+/-2.0	9.0+/-2.2	9.4+/-2.2	7.1+/-1.6	12.0+/-3.0	7.3+/-2.7

Note: Units are in mg/l unless otherwise noted.

Table 5.1 Water Quality in Area Wells (Continued)

	Duderstaedt 1	Duderstaedt 2	Hausman 1	Hausman 2	Walker 1	Anklam 1	O.Bluntzer 1	Halepeska 1
Ca	195	135	100	125	250	88	103	125
Mg	12.0	8.3	15.0	5.9	35.0	16.0	11.0	14.0
Na	104	68	95	21	130	99	48	219
K	3.9	2.1	3.9	1.9	35.0	3.5	2.1	2.5
CO3	0	0	0	0	0	0	0	0
HCO3	433	429	316	340	271	328	389	432
SO4	72	27	35	14	535	38	19	99
Cl	206	95	146	44	226	131	40	254
NO3-N	21.00	11.00	2.10	5.40	<0.01	2.00	2.70	10.00
F	0.27	0.26	0.47	0.18	0.49	0.51	0.38	0.60
SiO2	37	37	36	31	40	31	64	57
TDS	857	630	600	440	1420	600	455	1030
EC μmhos	1560	1040	1030	647	1980	995	647	1680
ALK	355	352	259	279	222	269	319	354
pH	6.99	7.02	7.27	7.18	7.13	7.23	7.29	7.14
As	0.002	0.003	<0.001	0.003	0.001	0.001	0.007	0.035
Cd	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Fe	<0.01	<0.01	<0.01	0.01	0.02	<0.01	0.01	<0.01
Pb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Mn	<0.01	<0.01	<0.01	<0.01	0.10	<0.01	<0.01	<0.01
Hg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Mo	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Se	0.004	0.002	0.002	0.002	<0.001	0.002	0.001	<0.001
U	0.002	0.005	0.002	0.001	0.003	0.003	0.002	0.004
Ammonia	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ra-226 pCi/l	0.3+/-0.1	0.3+/-0.1	0.3+/-0.1	1.1+/-0.1	1.1+/-0.1	0.7+/-0.1	0.3+/-0.1	0.3+/-0.1
Alpha pCi/l	3.3+/-4.1	6.3+/-3.3	5.4+/-3.3	2.1+/-2.1	10.0+/-6	13.0+/-4.0	4.9+/-2.4	11.0+/-6
Beta pCi/l	6.7+/-2.4	7.3+/-1.8	7.5+/-1.9	5.2+/-1.4	21.0+/-5.0	9.6+/-2.0	4.6+/-1.3	6.1+/-3.4

Note: Units are in mg/l unless otherwise noted.

Table 5.1 Water Quality in Area Wells (Continued)

	Abrameit 1	Bitterly 1	Liesman 1	Shrade 1	Wacker 1	Stanford 1	Long 1	Edwards 1
Ca	113	127	140	78	115	100	105	100
Mg	20.0	20.0	11.0	17.0	21.0	18.0	19.0	20.0
Na	95	87	72	135	86	87	96	92
K	3.7	2.4	2.3	3.7	4.2	3.0	3.0	3.6
CO3	0	0	0	0	0	0	0	0
HCO3	314	326	443	333	320	309	318	322
SO4	45	42	38	40	37	43	55	43
Cl	178	182	84	162	175	162	173	166
NO3-N	1.40	2.10	5.40	1.40	3.10	2.70	0.60	1.50
F	0.65	0.62	0.30	0.65	0.70	0.60	0.62	0.65
SIO2	33	29	36	31	31	37	42	35
TDS	668	665	621	618	645	670	646	675
EC µmhos	1120	1150	1020	1100	1100	1020	1140	1050
ALK	257	267	363	273	262	253	261	264
pH	7.37	7.26	7.18	7.53	7.38	7.64	7.28	7.48
As	0.005	0.002	0.004	<0.001	0.001	0.003	0.002	0.003
Cd	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Fe	0.01	0.02	0.01	0.02	0.01	0.02	<0.01	0.01
Pb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Mn	0.03	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
Hg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Mo	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Se	0.003	0.006	0.003	0.002	0.004	0.002	0.001	0.002
U	0.003	0.002	0.004	0.004	0.002	0.002	0.003	0.003
Ammonia	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ra-226 pCi/l	1.0+/-0.1	0.5 +/-0.1	0.6 +/- 0.1	0.4 +/- 0.1	0.4 +/- 0.1	0.2+/-0.1	1.1+/-0.1	0.3+/-0.1
Alpha pCi/l	8.7+/-3.6	9.7+/-3.7	4.9+/-3.2	5.5+/-3.5	6.4+/-3.4	8.1+/-3.6	8.5+/-3.7	6.7+/-3.5
Beta pCi/l	5.8+/-2.5	4.8+/-2.1	5.2+/-2.1	6.6+/-1.9	6.6+/-1.9	7.4+/-2.0	29.0+/-3	5.4+/-2.1

Note: Units are in mg/l unless otherwise noted.

Table 5.1 Water Quality in Area Wells (Continued)

	Braquet 1	Braquet 2	Jolly 1	Martin 1	Bluntzer 2	Church 1	Church 2	Becker 1
Ca	290	102	105	95	113	125	340	81
Mg	36.0	21.0	20.0	7.6	12.0	16	27	19
Na	133	115	96	20	44	124	120	120
K	2.4	3.1	4.3	1.6	2.6	1.6	3.6	2.5
CO3	0	0	0	0	0	0	0	0
HCO3	336	337	328	344	375	504	359	362
SO4	21	58	43	8	15	27	184	46
Cl	583	164	160	19	56	124	474	126
NO3-N	14.0	<0.01	1.80	2.90	4.90	3.00	10.00	0.13
F	0.34	0.60	0.62	0.40	0.65	0.55	0.21	0.79
SiO2	54	40	35	36	59	63	37	39
TDS	1370	685	663	390	520	751	1510	638
EC µmhos	2460	1140	1090	532	778	1170	2360	1020
ALK	275	276	269	282	307	413	294	297
pH	7.27	7.38	7.42	7.44	7.37	7.27	7.12	7.43
As	0.007	<0.001	0.004	0.005	0.008	0.008	0.002	<0.001
Cd	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Fe	0.01	0.04	0.03	0.01	0.06	0.03	<0.01	0.03
Pb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Mn	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Mo	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Se	0.003	<0.001	0.001	0.001	0.002	0.004	0.005	0.001
U	0.003	0.002	0.003	0.003	0.001	0.003	0.003	0.004
Ammonia	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ra-226 pCi/l	0.6+/-0.1	29.0+/-1.0	0.8+/-0.1	0.8+/-0.1	0.7+/-0.1	0.2+/-0.1	0.2+/-0.1	0.2+/-0.1
Alpha pCi/l	4.9+/-6.3	35.0+/-7	4.4+/-2.8	3.5+/-2.0	2.5+/-2.2	7.3+/-4.0	8.9+/-6.7	7.5+/-3.6
Beta pCi/l	7.9+/-3.7	9.3+/-2.5	8.4+/-2.4	5.7+/-1.3	5.8+/-1.6	4.5+/-2.4	6.7+/-3.5	5.6+/-1.8

Note: Units are in mg/l unless otherwise noted.

Table 5.1 Water Quality in Area Wells (Continued)

	Wimberly 1	Bade 1	Bade 2	Breeden 1	Breeden 2	Breeden 3	Schley 1	Tolbert 3
Ca	83	110	110	123	195	33	115	215
Mg	16	19	18	12	31	14	20	37
Na	113	105	110	49	198	185	101	210
K	3.7	3.6	3.6	2.0	4.4	4.2	3.9	4.9
CO3	0	0	0	0	0	0	0	0
HCO3	325	312	310	293	320	361	310	317
SO4	2	60	60	35	84	26	82	119
Cl	165	178	178	124	468	176	166	533
NO3-N	<0.01	1.30	1.50	1.20	<0.01	<0.01	1.40	<0.01
F	0.43	0.51	0.57	0.43	0.47	0.60	0.62	0.45
SIO2	32	40	42	42	38	26	41	37
TDS	600	685	665	543	1280	643	693	1440
EC µmhos	1010	1160	1150	892	2100	1140	1140	2310
ALK	266	256	254	240	262	296	254	260
pH	7.50	7.39	7.33	7.38	7.26	7.57	7.42	7.22
As	0.001	0.002	0.003	0.009	<0.001	<0.001	0.002	<0.001
Cd	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Fe	0.05	<0.01	<0.01	0.02	1.1	0.08	0.04	0.06
Pb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Mn	0.03	<0.01	<0.01	0.01	0.03	<0.01	<0.01	0.03
Hg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Mo	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Se	<0.001	0.001	0.002	0.012	<0.001	<0.001	0.002	<0.001
U	<0.001	0.002	0.002	0.004	<0.001	<0.001	0.003	<0.001
Ammonia	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ra-226 pCi/l	0.5+/-0.1	0.6+/-0.1	1.0+/-0.1	12.0+/-1.0	15.0+/-1.0	1.1+/-0.1	1.1+/-0.1	16.0+/-1.0
Alpha pCi/l	1.7+/-2.3	6.6+/-3.7	11.0+/-4.0	15.0+/-4.0	18.0+/-7.0	2.8+/-3.2	4.4+/-3.6	30+/-9
Beta pCi/l	5.2+/-2.2	6.3+/-2.0	7.2+/-2.0	6.6+/-1.6	6.7+/-2.1	6.7+/-2.1	5.3+/-2.3	8.8+/-4.6

Note: Units are in mg/l unless otherwise noted.

Table 5.1 Water Quality in Area Wells (Continued)

	Brown 1	Halepeska 2	C.Tolbert 1	Jacob's Well Old Rig Well	Abrameit Windmill	Dornberg 1	Jacob Rig Supply
Ca	105	75	96	81	88	108	51
Mg	19	16.0	11	17	16	18	13
Na	103	128	80	120	97	100.8	136
K	3.6	3.7	2.2	3.7	2.5	3.9	4.6
CO3	0	0	0	0	0	0	0
HCO3	303	331	399	326	340	299	361
SO4	37	38	30	11	20	35	19
Cl	180	146	64	165	148	201	146
NO3-N	1.60	1.40	1.3	<0.01	<0.01	1.3	0
F	0.57	0.62	0.97	0.44	0.57	0.49	0.50
SiO2	38	32	61	28	28	34	22
TDS	693	608	550	573	546	613	504
EC µmhos	1110	1050	852	972	922	1160	997
ALK	248	271	327	267	279	245	296
pH	7.35	7.40	7.44	7.52	7.56	7.56	7.48
As	0.002	0.001	0.011	<0.001	0.028	0.005	0
Cd	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.001
Fe	0.03	<0.01	<0.01	<0.01	0.05	<0.01	0
Pb	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	0
Mn	<0.01	<0.01	<0.01	0.01	0.24	<0.01	0.02
Hg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0
Mo	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0
Se	0.002	0.003	0.002	<0.001	<0.001	<0.001	0
U	0.002	0.004	0.001	<0.001	0.004	0.003	0.005
Ammonia	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0
Ra-226 pCi/l	0.4+/-0.1	1.0 +/- 0.1	0.1+/-0.1	10.0+/-1.0	1.9+/-0.1	0.5+/-0.1	2.4
Alpha pCi/l	5.1+/-3.5	10.0+/-4	2.8+/-2.5	11+/-4	31+/-6		
Beta pCi/l	5.4+/-2.2	6.8+/-2.3	2.8+/-1.5	7.8+/-1.8	18+/-3		

Note: Units are in mg/l unless otherwise noted.

Table 5.2 Statistical Summary of Water Quality in Area Wells

	Average Value	Minimum Value	Maximum Value	Standard Deviation	EPA Standard*
Ca	122	33	340	56	NS
Mg	17	5.9	37.0	6.7	NS
Na	106	20	219	45	NS
K	3.8	1.6	35	4.7	NS
CO_3	0	0	0	0	NS
HCO_3	350	271	504	51	NS
SO_4	55	2	535	79	250
Cl	178	19	583	117	250
NO3-N	3.12	<0.01	21	4.4	10
F	0.53	0.18	0.97	0.17	4.0
SIO_2	40	22	72	11	NS
TDS	716	390	1510	273	500
EC (µmhos)	1184	532	2460	434	NS
ALK	287	222	413	42	NS
pH	7.33	6.99	7.64	0.16	6.5 to 8.5
As	0.005	<0.001	0.035	0.007	0.01
Cd	<0.0001	<0.0001	0.0002	0.0001	0.005
Fe	0.04	<0.01	1.1	0.16	0.3
Pb	<0.001	<0.001	0.001	0.001	0.015
Mn	0.02	<0.01	0.24	0.05	0.05
Hg	<0.0002	<0.0002	<0.0002	0.0000	0.002
MO	<0.1	<0.1	<0.1	0.0	NS
Se	0.002	<0.001	0.012	0.002	0.05
U	0.003	<0.001	0.009	0.002	0.03
Ammonia	<0.1	<0.1	<0.1	0.0	NS
Ra-226 (pCi/l)	2.3	0.1	29.0	5.4	5.0
Gross Alpha (pCi/l)	9.9	1.7	35.0	7.7	15
Gross Beta (pCi/l)	8.2	2.8	29.0	4.6	15

Notes: Units are in milligrams per liter (mg/l) unless otherwise noted.

Maximum Contaminant Levels (MCL) for drinking water.

NS: No standard.

Apart from groundwater quality varying in relation to the degree of mineralization, quality can be affected by human activities. Elevated nitrate levels, for example, are commonly found in rural areas where ranching and farming occur. Although animal waste products and fertilizers are often the source of the elevated contaminant, septic tanks are also a source. Of the 47 wells listed in Table 5.1, six have elevated nitrate levels. The highest concentration (21 mg/l) was found in the Duderstaedt number 1 well. The nitrate level is more than twice EPA's Maximum Contaminant Level (MCL) of 10 mg/l. The Duderstaedt number 2 well (11 mg/l) is also in excess of the standard. Other wells with nitrate concentrations at or in excess of the EPA standard are: Jacob 1 (11 mg/l); Halepeska 1 (10 mg/l); Braquet 1 (14 mg/l); and St. Peter's Church 2 (10 mg/l).

With respect to elevated constituents related to natural mineralization, the following wells were noted.

	Arsenic (mg/l)	Iron (mg/l)	Manganese (mg/l)	Ra-226 (pCi/l)
Jacob 1	0.016			
Jacob 2	0.016			
Jacob Old Rig Well				10.0+/-1.0
Rutherford 2			0.24	
Abrameit Windmill	0.028		0.24	
Halepeska 1	0.035			
Braquet 2				29.0 +/-1.0
Breeden 1				12.0 +/-1.0
Breeden 2		1.1		15.0+/-1.0
Tolbert 3				16.0+/-1.0
C. Tolbert 1	0.011			

As previously noted, it is common to find elevated metals and other constituents in areas that have strong mineralization. Obviously, UEC's proposed permit area has commercial grade uranium deposits, and therefore areas proximate to these ore zones too will show mineralization. A good example of this is the Braquet number 2 well. As the table above shows, Ra-226, a decay product of natural uranium, is somewhat elevated. After receiving the laboratory report, UEC ran a gamma log on the Braquet number 2 well. As expected, the well is in a uranium ore zone. The other wells in the table that have elevated Ra-226 values are no doubt in a uranium ore zone. All of the values exceed the EPA Drinking Water Standard of 5 pCi/l.

The arsenic values in the above table are above the EPA Drinking Water Standard of 0.01 mg/l. Two wells exceed EPA's Secondary Standard for manganese (0.05 mg/l) by quite a margin. The Rutherford number 2 well, for example, is nearly 5 times higher than the standard, and the same can be said for the Abrameit Windmill. Finally, the 1.1 mg/l iron concentration in the Breeden number 2 well is more than 3.5 times above EPA's Secondary Standard of 0.3 mg/l. Again, it is not uncommon to find this level of variation in groundwater near mineralized zones.

Up to this point, the water quality discussion had been mainly focused on individual wells. Table 5.2 allows a comparison to be made between EPA Drinking Water Standards and the average water quality found in the study area as a whole. A summary of where local water quality stands with respect to EPA standards follows.

With respect to chloride and sulfate, the average values in the study area are well below the Maximum Concentration Limits (MCL) of 250 mg/l. Nitrate levels are somewhat elevated at 3.12 mg/l but this value is well below the MCL of 10 mg/l. As noted earlier, rural land uses such as farming and ranching contribute to higher than normal nitrate levels. The average for total dissolved solids (TDS) is 716 mg/l, and this exceeds the 500 mg/l MCL. Since most native groundwater in South Texas exceeds the 500 mg/l MCL, the local water quality for this parameter is not unusual. Figure 5.2 TDS Contour Map (see Map Appendix) shows TDS concentrations across the site and within the AOR.

Average concentrations for metals (As, Cd, Fe, Pb, Mn, Hg, MO, Se and U) are all less than their respective MCL. Although it is under the 5 pCi/l MCL, Ra-226 is slightly elevated. Generally, Ra-226 in groundwater is 1 pCi/l or less. Referring back to Table 5.1 for example, it can be seen that 30 of the 47 wells have less than 1 pCi/l Ra-226. However, 16 or 34 percent of the wells have Ra-226 values at or in excess of 1 pCi/l, and this, along with several wells with values in excess of 10 pCi/l, has raised the overall average value. Again, because the study area is in a known uranium ore trend, a higher than normal frequency of elevated Ra-226 values is to be expected.

The presence of a mineralized zone was mentioned several times in the discussion above. It was also noted that groundwater quality can vary significantly, depending on the degree of mineralization. The subsequent section, 5.3 Mine Area Baseline Water Quality, will clearly illustrate the dramatic difference between groundwater quality in a mineralized zone and a non-mineralized or slightly mineralized zone.

5.3 Permit Area Baseline Water Quality

UEC completed 20 baseline wells within the proposed permit area, and the results are listed in Table 5.3. A review of Table 5.3 shows that a number of water quality parameters compare favorably with those from water wells within the 1 km AOR. That is to say, the concentrations of certain water quality constituents found in the permit area are similar to those reported for the wells in the 1 km AOR. To illustrate, levels of Ca, Mg, Na, Cl, F, AlK, pH, Fe and Mn, are very much the same in both areas. Also, the concentrations of Cd, Pb and Hg in the permit area baseline wells are very low and nearly identical with those in the AOR. Since there are no significant deposits of these metals in this part of Texas, only trace amounts would be detected. If significant levels were found, it would be the result of contamination.

Table 5.3 Baseline Wells within the Permit Boundary

	RBLA-1	RBLA-2	RBLA-3	RBLA-4	RBLA-5	EPA Standards
Ca	97	91	110	140	83	**NS**
Mg	10.0	6.0	9.3	10.0	4.8	**NS**
Na	36	69	50	115	44	**NS**
K	3.3	11.0	3.7	5.1	10.5	**NS**
CO3	<1	0	0	<1	0	**NS**
HCO3	328	288	249	393	281	**NS**
SO4	43	38	16	56	29	**250**
Cl	44	116	139	218	62	**250**
NO3-N	<0.05	0	<0.01	0.08	0	**10**
F	0.5	0.70	0.53	0.8	0.50	**4.0**
SIO2	34.9	54.1	46.0	41.2	36.3	**NS**
TDS	400	550	540	782	422	**500**
EC µmhos	686	886	851	1350	697	**NS**
ALK	269	236	204	323	230	**NS**
pH s.u.	7.39	7.43	7.42	7.11	7.48	**6.5 to 8.5**
As	0.003	0.034	0.031	0.045	0.015	**0.01**
Cd	ND	0	0.0001	ND	0	**0.005**
Fe	ND	0	0.01	ND	0	**0.3**
Pb	ND	0	0.001	ND	0	**0.15**
Mn	ND	0.01	0.01	0.01	0	**0.05**
Hg	ND	0	<0.0002	ND	0	**0.002**
Mo	ND	0.4	0.3	0.4	0.2	**NS**
Se	ND	0.004	<0.001	0.002	0.002	**0.05**
U	0.018	0.286	0.127	0.147	0.266	**0.03**
Ammonia	<0.1	0.06	<0.1	<0.1	0	**NS**
Ra-226 pCi/l	735+/-8.5	989+/-10.3	3160+/-10	904+/-9.3	937+/-10.0	**5pCi/l**

Note: Units are expressed in mg/l unless otherwise noted.

Table 5.3 Baseline Wells within the Permit Boundary (Continued)

	RBLB-1	RBLB-2	RBLB-3	RBLB-4	RBLB-5	**EPA Standards**
Ca	100	78	91	101	88	**NS**
Mg	19.0	10.0	15.8	20.2	16.5	**NS**
Na	98	94	95	100	94	**NS**
K	6.6	18.0	8.9	7.1	4.4	**NS**
CO3	0	0	0	0	0	**NS**
HCO3	332	255	302	325	340	**NS**
SO4	32	29	41	69	9	**250**
Cl	161	151	163	150	163	**250**
NO3-N	0	<0.01	0	0	0	**10**
F	0.70	0.55	0.70	0.70	0.80	**4.0**
SIO2	32.2	32.0	31.6	32.0	31.6	**NS**
TDS	644	560	614	666	584	**500**
EC µmhos	1160	939	1070	1140	1050	**NS**
ALK	272	209	253	266	279	**NS**
pH s.u.	7.43	7.60	7.79	7.54	7.63	**6.5 to 8.5**
As	0.006	0.007	0.030	0.004	0.009	**0.01**
Cd	0	0.0003	0	0	0	**0.005**
Fe	0	0.02	0	0	0	**0.3**
Pb	0	0.001	0	0	0	**0.15**
Mn	0.02	0.01	0.02	0	0.02	**0.05**
Hg	0	<0.0002	0	0	0	**0.002**
Mo	0	<0.1	0	0	0	**NS**
Se	0.001	<0.001	0.002	0.001	0.001	**0.05**
U	0.062	0.059	0.080	0.006	0.060	**0.03**
Ammonia	0	<0.1	0.05	0.08	0.06	**NS**
Ra-226 pCi/l	393+/-5.7	12+/-1	111+/-3.9	37+/-2.1	1090+/-9.6	**5pCi/l**

Note: Units are expressed in mg/l unless otherwise noted.

Table 5.3 Baseline Wells within the Permit Boundary (Continued)

	RBLC-1	RBLC-2	RBLC-3	RBLC-4	RBLC-7	EPA Standards
Ca	75	71	79.8	81	95	**NS**
Mg	14.6	9.8	17.1	17	17.0	**NS**
Na	92	97	97.1	100	96	**NS**
K	14.6	11.9	4.2	7.1	4.8	**NS**
CO3	0	0	ND	0	0	**NS**
HCO3	295	249	340	344	328	**NS**
SO4	57	32	11	11	38	**250**
Cl	130	125	150	130	146	**250**
NO3-N	0	0	ND	0	<0.01	**10**
F	0.60	0.60	0.5	0.50	0.55	**4.0**
SIO2	23.8	21.5	25.6	24.8	30.0	**NS**
TDS	558	534	510	566	540	**500**
EC µmhos	986	890	982	1010	1010	**NS**
ALK	242	204	278	282	269	**NS**
pH s.u.	7.59	7.94	7.45	7.71	7.48	**6.5 to 8.5**
As	0.009	0.024	0.006	0.004	0.001	**0.01**
Cd	0	0	ND	0	0.0001	**0.005**
Fe	0	0.03	ND	0.05	0.01	**0.3**
Pb	0	0	ND	0	0.001	**0.15**
Mn	0	0	ND	0	0.02	**0.05**
Hg	0	0	ND	0	<0.0002	**0.002**
Mo	0	1.9	ND	0	<0.1	**NS**
Se	0.005	0.024	0.001	0.001	0.006	**0.05**
U	0.008	6.680	0.031	0.055	0.020	**0.03**
Ammonia	0.11	0.09	ND	0.09	<0.1	**NS**
Ra-226 pCi/l	10.0+/-1.1	692+/-9.0	71.2+/-2.6	136+/-3.9	18+/-1	**5pCi/l**

Note: Units are expressed in mg/l unless otherwise noted.

Table 5.3 Baseline Wells within the Permit Boundary (Continued)

	RBLD-1	RBLD-2	RBLD-3A	RBLD-5	RBLD-6	**EPA Standards**
Ca	88	74	68	73	90	**NS**
Mg	19.0	16.9	14.3	18.0	17.0	**NS**
Na	106	110	105	114	106	**NS**
K	4.5	4.1	6.0	7.1	4.7	**NS**
CO3	0	ND	ND	0	0	**NS**
HCO3	334	341	330	295	318	**NS**
SO4	10	12	6	19	13	**250**
Cl	164	164	158	164	168	**250**
NO3-N	<0.01	ND	ND	<0.01	<0.01	**10**
F	0.49	0.5	0.5	0.39	0.51	**4.0**
SIO2	29.0	27.9	29.1	30.0	34.0	**NS**
TDS	598	534	568	575	623	**500**
EC (µmhos)	996	1020	1040	998	978	**NS**
ALK	274	279	271	242	261	**NS**
pH (S.U.)	7.48	7.59	7.54	7.49	7.57	**6.5 to 8.5**
As	0.003	0.001	ND	0.010	0.002	**0.01**
Cd	0.0001	ND	ND	0.0001	0.0001	**0.005**
Fe	0.02	ND	0.11	0.01	0.01	**0.3**
Pb	<0.001	ND	ND	0.001	0.001	**0.15**
Mn	0.01	ND	ND	0.01	0.01	**0.05**
Hg	<0.0002	ND	ND	<0.0002	<0.0002	**0.002**
Mo	<0.1	ND	ND	<0.1	<0.1	**NS**
Se	<0.001	0.003	0.001	<0.001	<0.001	**0.05**
U	0.037	0.017	0.006	0.035	0.019	**0.03**
Ammonia	<0.1	<0.1	ND	<0.1	<0.1	**NS**
Ra-226	50+/-1	207+/-4.4	539+/-19.3	442+/-2.0	1040+/-10	**5pCi/l**

Note: Units are expressed in mg/l unless otherwise noted.

Although water quality is similar for a number of constituents, there is a vast difference in the levels of uranium and Ra-226. To underscore this difference, Radium-226 and uranium values were taken from Table 5.2 Statistical Summary of Water Quality in Area Wells and Table 5.4 Statistical Summary of Baseline Wells and placed in the table below.

	Ra-226 (pCi/l)	Uranium (mg/l)	EPA Drinking Water Standard*
Permit Area Average	579	0.401	5 pCi/l (Ra-226)
Permit Area High	3,160	6.68	0.03 mg/l (Uranium)
AOR Area High	29	0.009	
AOR Average	2.31	0.003	

*Maximum Contaminant Level (MCL).

The average Ra-226 concentration in the permit area is approximately116 times higher than the drinking water standard, and the average uranium level is 13.4 times higher than the standard. The highest Ra-226 level of 3,160 pCi/l is 632 times higher than the 5 pCi/l standard, and the highest uranium value is 223 times over the standard. Clearly, compared to background levels recorded in the AOR, permit area baseline wells have very poor water quality with respect to uranium and Ra-226.

In stark contrast, the average uranium and Ra-226 levels in the AOR meet EPA Drinking Water Standards. For example, the average uranium level of 0.003 mg/l is 10 times lower than the standard. Although slightly elevated, Ra-226 (2.3 pCi/l) is only 46% of the 5pCi/l MCL.

The comparisons above demonstrate that although water quality in a uranium ore trend may be similar in some respects to water quality in non-mineralized areas, it differs significantly in terms of uranium and Ra-226 concentrations.

Table 5.4 Statistical Summary of Baseline Wells

	Average	High	Low	STDEV	EPA
Ca	89	140	68	16	**NS**
Mg	14.1	20.2	4.8	4.6	**NS**
Na	91	115	44	23	**NS**
K	7.4	18.0	3.7	4.0	**NS**
CO3	0	0	0	0.0	**NS**
HCO3	313	393	249	36	**NS**
SO4	29	69	6	18	**250**
Cl	143	218	62	38	**250**
NO3-N	0.01	0.08	0.08	0	**10**
F	0.58	0.80	0.39	0.11	**4.0**
SIO2	32.4	54	22	7.6	**NS**
TDS	568	782	422	81	**500**
EC µmhos	987	1350	697	148	**NS**
ALK	257	323	204	30	**NS**
pH	7.53	7.94	7.11	0.17	**6.5 to 8.5**
As	0.013	0.045	0.001	0.013	**0.01**
Cd	0.0001	0.0003	0.0001	0	**0.005**
Fe	0.02	0.11	0.01	0.01	**0.3**
Pb	0.001	0.001	0.001	0	**0.15**
Mn	0.01	0.02	0.01	0.01	**0.05**
Hg	<0.0002	<0.0002	<0.0002	0	**0.002**
Mo	0.2	1.9	<0.1	0.4	**NS**
Se	0.003	0.024	<0.001	0.005	**0.05**
U	0.401	6.680	0.006	1.480	**0.03**
Ammonia	0.04	0.11	0	0.03	**NS**
Ra-226 pCi/l	579	3160	10.0	725	**5pCi/l**

Note: All units are expressed in mg/l unless otherwise noted.

In the discussion on page 5-16 a comparison was made between average and high values found in the permit area and average and high values in the AOR. Table 5.5 has been prepared to further emphasize the fact that portions of aquifers containing natural deposits of uranium typically have elevated levels of radium-226 and uranium.

Table 5.5 Comparison of Production Sand Water Quality Average Values

	A-Sand Average	B-Sand Average	C-Sand Average	D-Sand Average
Ca	104	92	80	79
Mg	8.0	16.3	15.1	17
Na	63	96	96	108
K	6.7	9.0	8.5	5.3
CO3	0	0	0	0
HCO3	308	311	311	324
SO4	36	36	30	12
Cl	116	158	136	164
NO3-N	0.02	0	0	0
F	0.6	0.7	0.6	0.5
SIO2	42.5	31.9	25.1	30
TDS	539	614	542	580
EC μmhos	894	1072	976	1006
ALK	252	256	255	265
pH Std. Units	7.37	7.60	7.63	7.50
As	0.026	0.011	0.009	0.004
Cd	0	0.0001	0	0.0001
Fe	0	0	0.02	0.04
Pb	0	0	0	0
Mn	0.01	0.01	0.01	0.01
Hg	0	0	0	0
Mo	0.3	0	0.4	0
Se	0.003	0.001	0.01	0.002
U	0.169	0.053	1.360	0.023
Ammonia	0	0	0.1	0
Ra-226 pCi/l	1345	329	185	456

Note: Units are expressed in mg/l unless other wise noted.

Chapter 6.0 Hydrology

STATE OF TEXAS
MICHAEL G. EIDE
GEOLOGY
No. 1730
LICENSED
PROFESSIONAL GEOSCIENTIST
1/29/08

The affixed seal covers the entire contents of this chapter.

6.0 Hydrology

Section six of the Permit Application Technical Report describes the regional and permit area hydrology relevant to UEC's ISR project.

6.1. Regional Hydrology

As described in previous sections, the project is located in northern Goliad County (see Figures 1.1 and 1.2). The site lies within the Coastal Plain physiographic region of Texas (Figure 6.1). The Coastal Plain is a relatively flat to undulating low-lying area adjacent to the current Gulf of Mexico shoreline and extends to the north and west away from the coast. The elevation of the Coastal Plain gradually rises to the north and west from sea level to an elevation of as much as 900 feet in the Coastal Uplands. The Coastal Plain is underlain by a thick wedge of interbedded and intermixed Tertiary and Quaternary clastic sediments of fluvial, deltaic, and marine origin that generally slope toward the Gulf of Mexico and outcrop to the north and west. The surficial geology of the Coastal Plain is complex due to recent and active reworking of deposits by erosion and deposition of modern streams and rivers (Chowdhury and Turco, 2006).

The climate of the upper Texas Coastal Plain region is characterized as subtropical humid. This climate classification is most noted for warm summers. The average annual rainfall for the northern portion of Goliad County is approximately 34 inches and the average gross lake surface evaporation rate is 61 inches. The prevailing wind direction is from the southeast (Larkin and Bomar, 1983).

6.1.1 Regional Hydrostratigraphic Framework

The regional hydrostratigraphic framework for the Texas Coastal Plain is illustrated in Figures 6.2 and 6.3 (Baker, 1979). In general, the Coastal Plain hydrostratigraphic framework in the UEC regional study area corresponds to the model outlined by Baker (1979) with all underground sources of drinking water (USDWs) being associated with post-Miocene series strata collectively known as the Gulf Coast Aquifer.

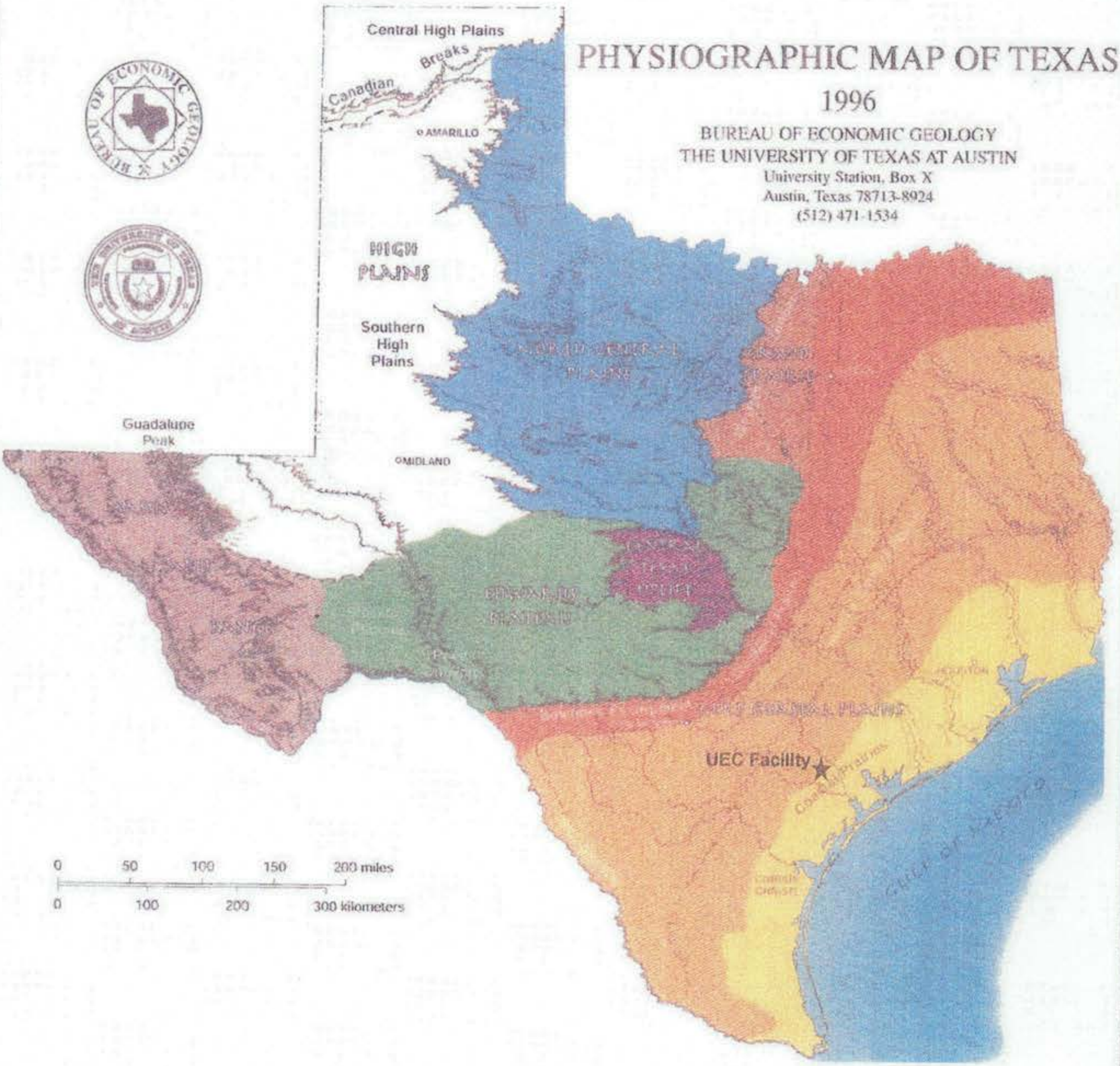

FIGURE 6.1

Physiographic Regions of Texas

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Weegar-Eide & Associates, LLC	7/11/07
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Fig 6-1.cdr	No Scale

Source: Wermund, E.G, 1996, Physiographic Map of Texas, The University of Texas at Austin Bureau of Econmoic Geology found at:
www.beg.utexas.edu/UTopia/images/pagesizemaps/physiography.pdf

Era	System	Series	Stratigraphic Units	Hydrogeologic Units	Selected Faunal Markers	Remarks
CENOZOIC	Quaternary	Holocene	Alluvium	Chicot aquifer		Quaternary System undifferentiated on sections.
		Pleistocene	Beaumont Clay Montgomery Formation Bentley Formation Willis Sand			
	Tertiary	Pliocene	Goliad Sand	Evangeline aquifer		Goliad Sand overlapped east of Lavaca County.
		Miocene	Fleming Formation	Burkeville confining system	*Potamides matsoni* *Bigenerina nodosaria var. directa* *Bigenerina humblei* *Amphistegina sp.*	
			Oakville Sandstone	Jasper aquifer		Oakville Sandstone included in Fleming Formation east of Washington County.
		?	Surface: Catahoula Tuff or Sandstone Subsurface: Upper part of Catahoula Tuff or Sandstone		*Discorbis nomada* *Discorbis gravelli* *Heterostegina sp.* *Marginulina idiomorpha*	Catahoula Tuff designated as Catahoula Sandstone east of Lavaca County.
			Subsurface: Anahuac Formation	Catahoula confining system (restricted)		Anahuac and "Frio" Formations may be Oligocene in age.
			Subsurface: "Frio" Formation		*Textularia mississippiensis*	
		Oligocene(?)	Surface: Frio Clay Subsurface: Vicksburg Group equivalent	Not discussed as hydrologic units in this report.	*Textularia warreni*	Frio Clay overlapped or not recognized on surface east of Live Oak County.
		?	Jackson Group: Whitsett Formation: Fashing Clay Member			Indicated members of Whitsett Formation apply to south-central Texas. Whitsett Formation east of Karnes County may be, in part or in whole, Oligocene in age.
			Jackson Group: Whitsett Formation: Calliham Sandstone Member or Tordilla Sandstone Member			
			Jackson Group: Whitsett Formation: Dubose Member		*Marginulina cocoaensis*	
			Jackson Group: Whitsett Formation: Deweesville Sandstone Member			
			Jackson Group: Whitsett Formation: Conquista Clay Member		*Textularia hockleyensis* *Massilina pratti*	
			Jackson Group: Whitsett Formation: Dilworth Sandstone Member			
		Eocene	Jackson Group: Manning Clay			
			Jackson Group: Wellborn Sandstone			
			Jackson Group: Caddell Formation		*Textularia dibollensis*	
			Claiborne Group: Yegua Formation		*Nonionella cockfieldensis* *Discorbis yeguaensis* *Eponides yeguaensis* *Ceratobulimina eximia*	
			Claiborne Group: Cook Mountain Formation			
			Claiborne Group: Sparta Sand			
			Claiborne Group: Weches Formation			
			Claiborne Group: Queen City Sand			
			Claiborne Group: Reklaw Formation			
			Claiborne Group: Carrizo Sand			
			Wilcox Group			
		Paleocene	Midway Group			

Source: Baker, E. T. Jr., 1979, Stratigraphic and Hydrogeologic Framework of Part of the Coastal Plain of Texas, Texas Department of Water Resources, Report 236, 43 pp.

FIGURE 6.2

Regional Hydrostratigraphic Framework for Texas Coastal Plain

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Fig 6-2.cdr	No Scale

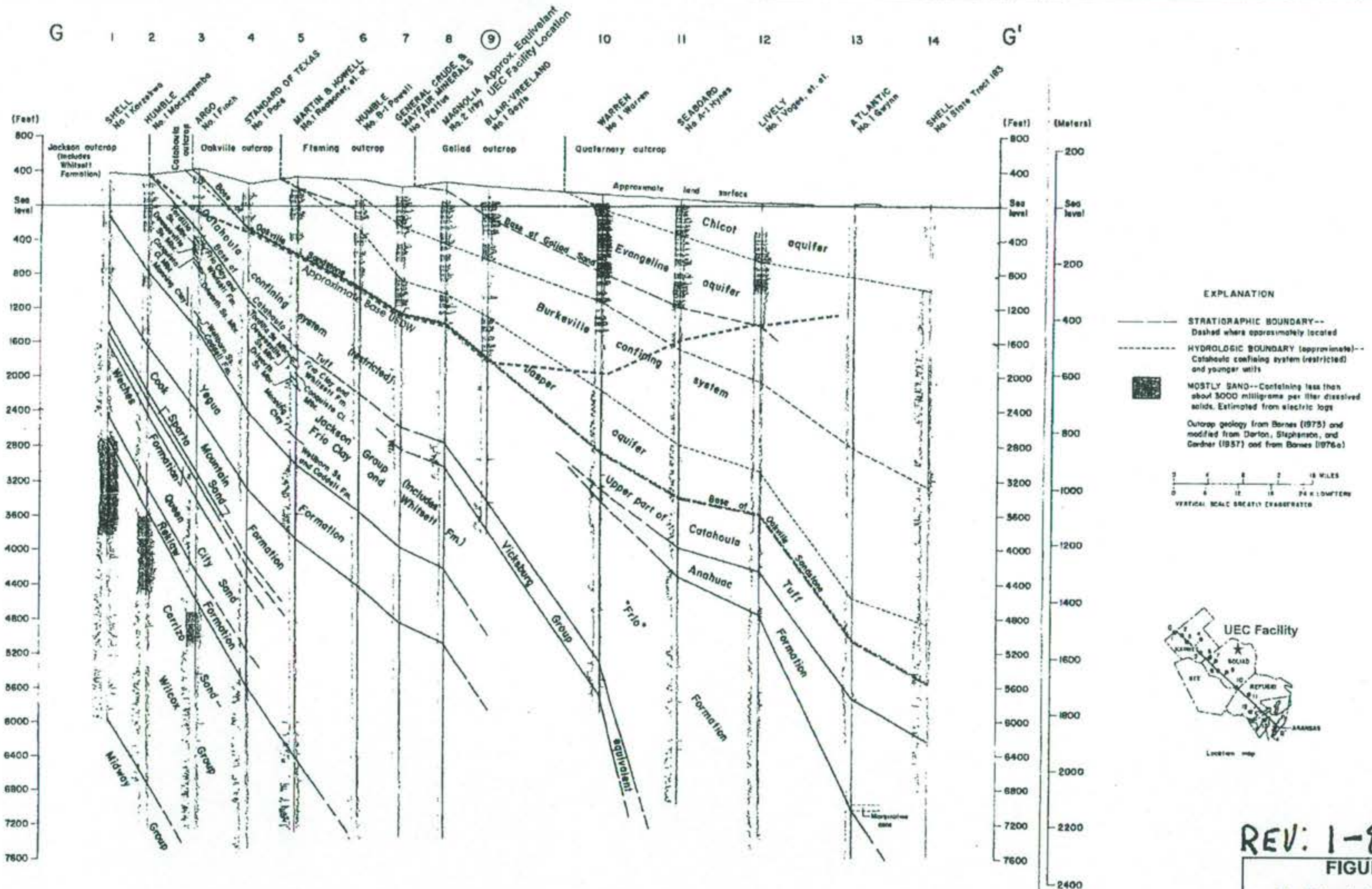

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FIGURE 6.3

Dip Oriented Cross-Section Showing Regional Hydrostratigraphic Framework

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Fig 6-3.cdr	See Scale Bar

Source: Baker, E. T. Jr., 1979, Stratigraphic and Hydrogeologic Framework of Part of the Coastal Plain of Texas, Texas Department of Water Resources, Report 236, 43 pp.

In general groundwater quality in the Gulf Coast Aquifer is good northeast of the San Antonio River but declines to the southwest due to increased chloride concentrations and saltwater intrusion near the present coastline (Chowdhury, et al., 2004). The Gulf Coast Aquifer is divisible into four discrete hydrogeologic units, which can generally be correlated to different stratigraphic units with distinct hydraulic properties.

The youngest and uppermost aquifer unit within the Gulf Coast Aquifer is the Chicot Aquifer, which consists of Pleistocene and Holocene Series strata (Figures 6.2 and 6.3). The Lissie Formation (equivalent to the Montgomery and Bentley Formations indicated in Figure 6.2) and Beaumont Clay are the two dominant subdivisions of the Pleistocene system. However, the Alto Loma Sand and Willis Formation can be locally extensive in parts of the Texas Coastal Plain. In northern Goliad County, the Pleistocene series is missing from the stratigraphic section and no Chicot Aquifer is present. The Chicot is an important aquifer down dip of the UEC regional study area closer to the present coast.

In the UEC regional study area the Goliad Sand outcrops at the surface and is part of the first aquifer unit encountered in the subsurface. As indicated in Figures 6.2 and 6.3, the Goliad is entirely contained within the Evangeline Aquifer; however the aquifer unit also extends into sands within the upper portion of the underlying Fleming Group. The Evangeline is typically wedge shaped and thickens significantly toward the coast. The Evangeline has a high sand-clay ratio and is a prolific aquifer moving towards the coast (Baker, 1979). In Goliad County, the Goliad Sand consists of up to 500 feet of predominantly sand containing some clay and gravel beds and is reported to yield small supplies of variable quality water to wells (Figure 6.4) (Dale, et al., 1957).

The Burkeville Confining System lies beneath the Evangeline Aquifer in the regional study area. The Burkeville is a hydrostratigraphic unit that separates the Evangeline Aquifer from the underlying Jasper Aquifer. The Burkeville generally corresponds to the Lagarto Clay of the Fleming Group and contains a relatively large percentage of silt and clay compared to the overlying and underlying aquifers and retards the interchange of water between the aquifers (Baker, 1979).

Age		Geologic unit	Approximate thickness (feet)	Character of rocks	Water supply
System	Series				
Quaternary	Recent	Alluvium	0-30	Clay, silt, sand, and gravel.	Not important as an aquifer in Goliad County.
Tertiary	Pleistocene	Beaumont clay	0-50	Clay containing layers of sand.	Not important as an aquifer in Goliad County.
		Lissie formation	0-500	Thick beds of sand containing lentils of gravel and layers of clay and silt.	Yields small supplies of fresh water for domestic and stock use.
	Pliocene	Goliad sand	0-500	Predominantly sandstone and sand containing some clay and gravel. The sand and gravel are impregnated with caliche.	Yields small supplies of water of variable quality for domestic and stock use.
	Miocene(?)	Lagarto clay	800-1,200	Clay and sandy clay containing interbedded layers of sand and sandstone	Yields moderately large supplies of fresh water for municipal and industrial use.
	Miocene	Oakville sandstone	450-700	Crossbedded sand and sandstone containing interbedded sandy, ashy, or bentonitic clay.	Yields moderately large supplies of fresh water for industrial use in the northwestern half of the county.
	Miocene(?)	Catahoula tuff	?	Predominantly volcanic tuff and tuffaceous clay containing sandstone lentils.	Not a fresh-water aquifer in Goliad County.

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Source: Dale, O. C., Moulder, E. A., and Arnow, T., 1957, Groundwater Resources of Goliad County, Texas, Texas Board of Water Engineers Bulletin 5711, 93 pp.

FIGURE 6.4

Hydrostratigraphic Column for Goliad County, Texas

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Weegar-Eide & Associates, LLC	7/10/07
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Fig 6-4.cdr	No Scale

In Goliad County, the Lagarto Clay consists of 800 to 1,200 feet of clay and sandy clay containing interbedded layers of sand and sandstone capable of yielding moderately large quantities of water to wells (Figure 6.4) (Dale, et al., 1957).

The Jasper Aquifer lies beneath the Burkeville Confining System in the Texas Coastal Plain region. In the regional study area, the base of the Jasper Aquifer corresponds with the base of the Oakville Sandstone of the Fleming Group and generally denotes the base of the USDW (Figures 6.3, through 6.6). However, moving down dip toward the coast, the Jasper Aquifer may extend into the sands associated with the Catahoula Tuff of the Catahoula Group where they are differentiated (Baker, 1979). In Goliad County the Oakville Sandstone is reported to consist of 450 to 700 feet of cross bedded sand and sandstone containing interbedded sandy bentonitic clay (Figure 6.4) (Dale, et al., 1957).

The base of the Texas Coastal Plain hydrostratigraphic framework is the Catahoula Confining System. In general, the Catahoula Confining System consists of up to 2,000 feet of predominantly clays and silts associated with the Lower Portion of the Catahoula Group including the Frio Formation, Anahuac Formation, and Catahoula Tuff. In Goliad County, the upper portion of the unit (Catahoula Tuff) is predominantly volcanic tuff and tuffaceous clay containing sandstone lentils and is not recognized as a USDW (Figure 6.4) (Dale, et al., 1957).

6.2. Permit Area Hydrology

The UEC Permit Area lies within northern Goliad County as indicated on Figures 1.1 through 1.3. The topography of the Permit Area is gently rolling and the elevation varies from a high of approximately 270 feet above mean seal level (MSL) in the western part of the permit area to a low of approximately 190 feet MSL in the southeastern portion of the area.

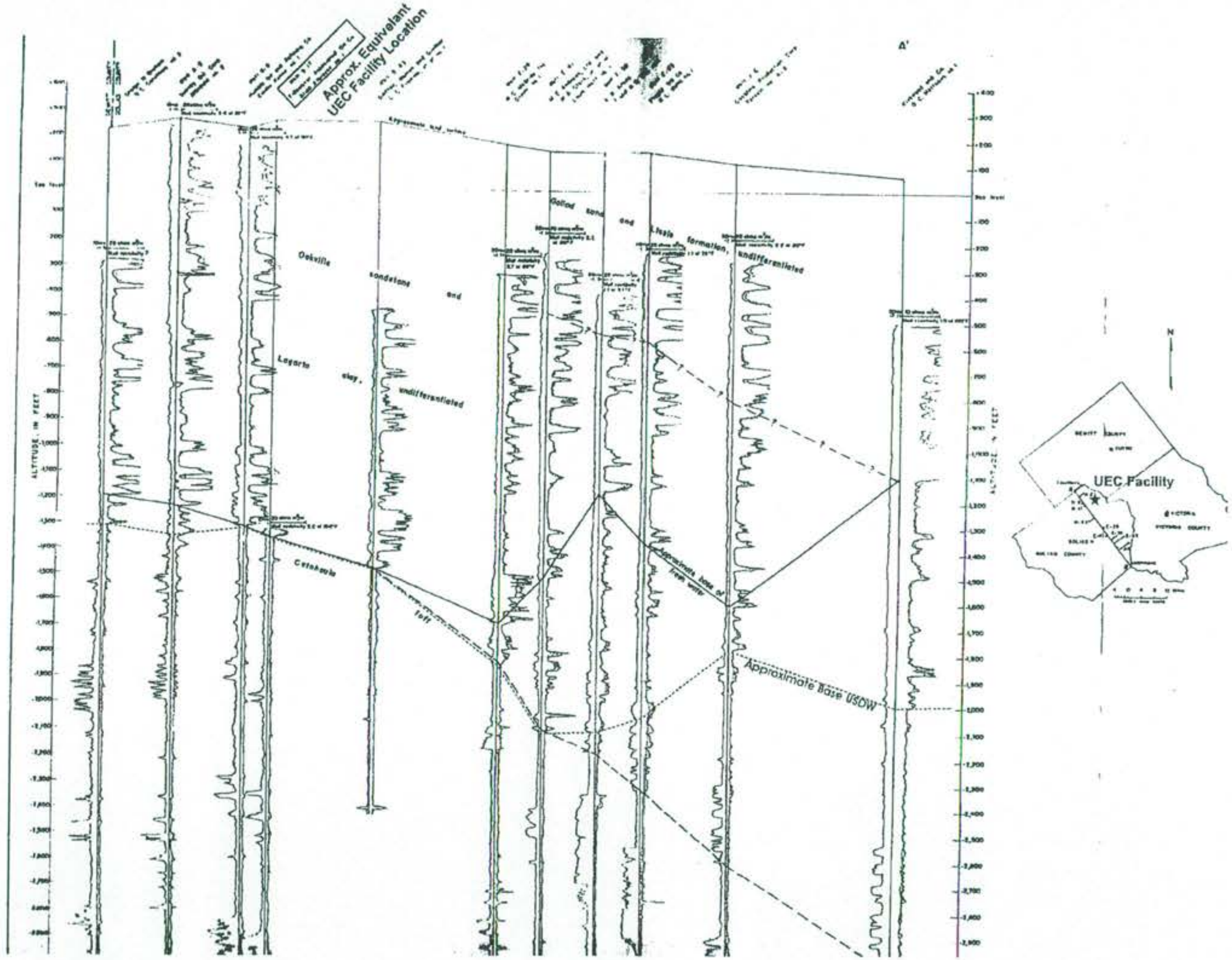

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FIGURE 6.5

Regional Dip Oriented Hydrogeologic Cross-Section Goliad County, Texas

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DRAWN BY: Weegar-Eide & Associates, LLC	DATE: 7/10/07
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Source: Dale, O. C., Moulder, E. A., and Arnow, T., 1957, Groundwater Resources of Goliad County, Texas, Texas Board of Water Engineers Bulletin 5711, 93 pp.

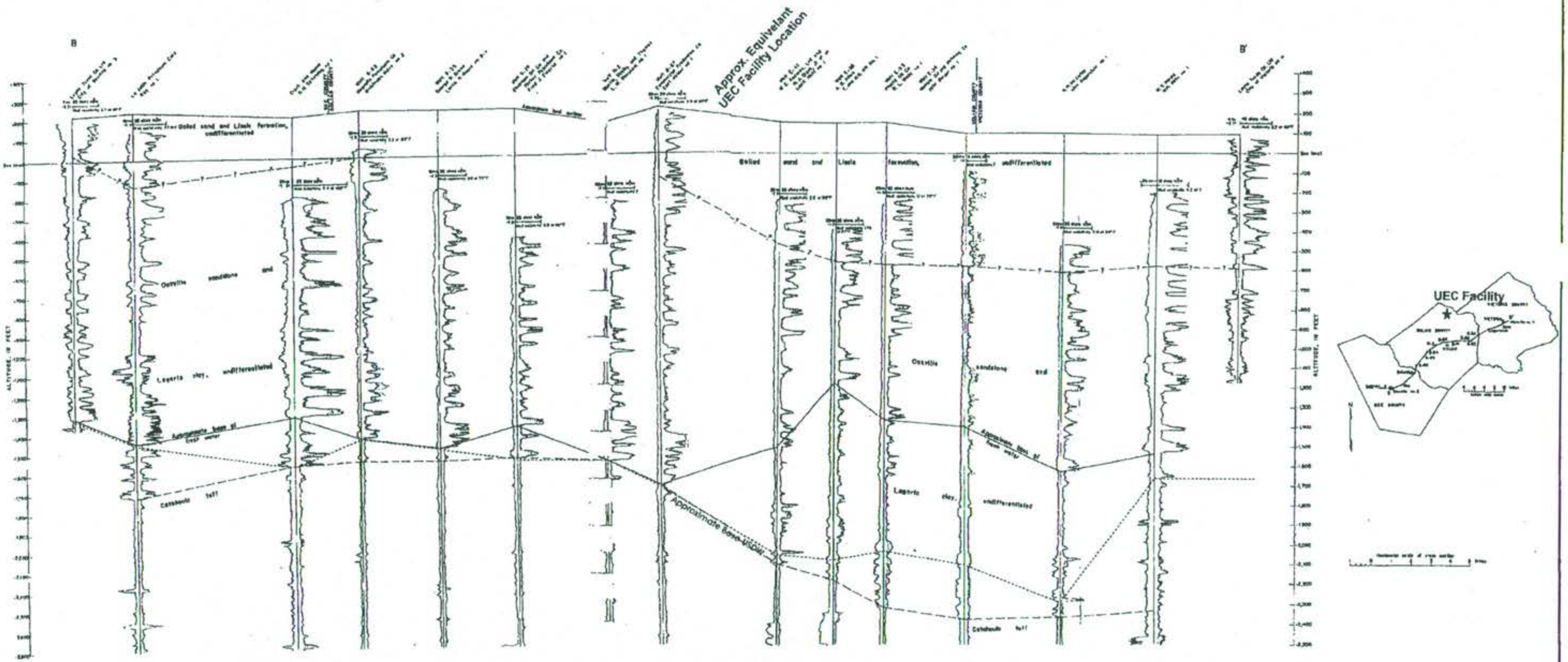

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FIGURE 6.6

Regional Strike Oriented Hydrogeologic Cross-Section Goliad County, Texas

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Uranium Energy Corp

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Weeger-Eide & Associates, LLC	7/10/07
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Source: Dale, O. C., Moulder, E. A., and Arnow, T., 1957, Groundwater Resources of Goliad County, Texas, Texas Board of Water Engineers Bulletin 5711, 93 pp.

The depth to groundwater in northern Goliad county ranges from several feet to approximately 100 feet below ground level (BGL). Recharge to the groundwater system is predominantly through surface infiltration of precipitation falling on the outcrop of the respective aquifer systems. The San Antonio River, which runs through the central part of the county, is the only permanent stream in Goliad County.

The uppermost aquifer within the UEC Permit Area is the Evangeline Aquifer. In general, the Evangeline Aquifer consists of the Goliad Sand in the regional study area. However, the boundary of the Evangeline may extend into the sands of the underlying Lagarto Clay of the Fleming Group. The Goliad Sand is reported to unconformably overlie the Lagarto Clay; however the basal sands of the Goliad are hard to distinguish from the sand beds within the upper portion of the Lagarto (Dale, et al., 1957). In general, the Goliad Sand consists of up to 500 feet of predominantly light colored, fine to coarse grained, sand and sandstone with interbedded clay and gravel. The sand and gravel are typically impregnated and cemented with caliche, which imparts the characteristic light color to the sands. The Goliad is reported to yield small quantities of variable quality water to wells in Goliad County. In the UEC permit area the base of the Goliad occurs at an approximate depth of 400 feet BGL.

Regionally, the Goliad Sand is generally viewed as a large single aquifer system. However within the proposed UEC Permit Area, hydrogeological study indicates that the Goliad can be subdivided into four (4) sand layers with intervening layers of clay which constitute confining strata. The stratigraphic relationship of the individual sand layers is illustrated in the detailed strike and dip oriented cross-sections whose locations are shown on Figure 6.7 Cross-section Index Map). The cross-sections are presented as Figures 6.8 through 6.13. Table 6.1 provides information on: (1) the average depth from the surface to the top and base of each production sand; (2) the average elevation of the top and base of each production sand, relative to Mean Sea Level (MSL); and (3) the average thickness of each production sand. Water levels obtained from UEC's baseline wells can be found on Table 6.2.

Figures 6.7 through 6.13 (see Map Appendix C)

Table 6.1 Production Zone Sand – Depth, Elevation and Average Thickness

Production Sand	Avg. Depth from Surface to Top (Feet)	Avg. Depth from Surface to Base (Feet)	Avg. Elevation from MSL* to Top (Feet)	Avg. Elevation from MSL * to Base (Feet)	Average Sand Thickness (Feet)
A Sand	45	99	197	131	65
B Sand	145	181	86	49	36
C Sand	212	269	3	-34	36
D Sand	304	385	-75	-155	80

*Mean Sea Level

Table 6.2 Permit Area Water Levels from Baseline Wells

	Depth to Ground Water Feet	Depth to Ground Water Feet*	Surface Elevation Feet
RBLA-1	64.61	62.86	221
RBLA-2	83.49	81.91	241
RBLA-3	80.50	79.38	238
RBLA-4	87.80	86.05	245
RBLA-5	74.54	72.46	231
RBLB-1	73.01	71.26	233
RBLB-2	50.30	49.05	220
RBLB-3	71.52	70.23	232
RBLB-4	71.73	70.19	233
RBLB-5	71.20	69.95	232
RBLC-1	76.50	74.71	244
RBLC-2	63.31	61.81	233
RBLC-3	64.53	62.86	226
RBLC-4	59.32	57.40	222
RBLC-7	71.20	70.24	245
RBLD-1	54.80	54.05	221
RBLD-2	83.32	81.24	231
RBLD-3A	70.00	69.00	220
RBLD-5	89.30	88.63	237
RBLD-6	88.35	87.10	254

*Depth to groundwater corrected for casing height above ground.

6.2.1 Permit Area Production Zone Sands

The four sand units have been internally labeled by UEC in descending order from the surface as: Sand A, Sand B, Sand C and Sand D. Each of these units constitutes a discrete individual aquifer unit within the mine area. In the study area, the Goliad Aquifer has a hydraulic gradient of approximately 5.5 feet per mile, and the direction of flow is to the southeast toward the Gulf of Mexico. Groundwater flow rate is approximately 6.7 feet per year.

Sand A is the uppermost sand in the permit area. This sand is the first sand unit encountered below the surface in the permit area. The average depth from the surface to the top of the sand is 45 feet, and its average thickness is 65 feet. It is capped by a clay layer of variable thickness that provides confinement. In a few small places outside of the area of mining interest, Sand A is exposed at the surface (Figures 6.8 through 6.13). Figures 6.14 and 6.15 are structure and isopach maps, respectively of Sand A within the permit area. The maps show faulting, variation in depth to the top of the unit and thickness of Sand A. Table 6.2 shows water levels taken from five baseline wells completed in Sand A. In general, Sand A is considered to be under water table conditions.

Sand B is the second aquifer unit encountered at an average depth of 145 feet BGL. Sand B is separated from the overlying Sand A by a substantial layer of clay, providing confinement. This confining layer is pervasive across the permit area. In general, Sand B is 36 feet thick and comprises one of the ore zones within the permit area. Figures 6.16 and 6.17 are structure and isopach maps, respectively of Sand B within the permit area. The maps show faulting, variation in depth to the top of the unit and thickness of Sand B. See Table 6.2 for Sand B water levels. In general, Sand B is also considered to be under confined conditions.

Sand C is the third sand unit encountered at an average depth of 212 feet BGL. Sand C is separated from the overlying Sand B by a substantial clay layer. In general, Sand C is 36 feet thick and comprises one of the ore zones within the permit area. Figures 6.18 and 6.19 are structure and isopach maps, respectively of Sand C within the permit area.

Figures 6.8 through 6.19 (see Map Appendix C)

The maps show faulting, variation in depth to the top of the unit and thickness of Sand C. Sand C is considered to be under confined conditions.

Sand D is the fourth sand unit encountered at an average depth of 304 feet BGL. This sand is separated from the overlying Sand C by a substantial clay layer that is pervasive throughout the permit area (see previously mentioned cross-sections). In general, Sand D is 80 feet thick and comprises one of the ore zones within the permit area. Figures 6.20 and 6.21 are structure and isopach maps, respectively of Sand D within the permit area. The maps show faulting, variation in depth to the top of the unit and thickness of Sand D. Sand D also is considered to be under confined conditions.

The Lagarto Clay (Fleming Group) is the next stratigraphic unit encountered beneath the Goliad Sand. The Lagarto conformably overlies the Oakville Sandstone in Goliad County. The Lagarto is reported to consist of up to 1,200 feet of dark colored clay and sandy clay with intercalated beds of sand and sandstone. In the permit area, the sand beds contain fresh water, which may be of better quality than that found in the overlying Goliad (Dale, et al. 1957). In general, the upper part of the Lagarto is sandier than the middle and lower portions. The sands in the upper portion of the Lagarto are considered to be part of the Evangeline Aquifer System, however the sands are separated from the overlying Goliad by relatively thick clay layers and probably constitute a discrete aquifer system comprising the first underlying aquifer. The middle and lower portions of the Lagarto constitute the Burkeville Confining System hydrostratigraphic unit described previously. However, discrete sands within the lower and middle Lagarto may contain large supplies of fresh water, which is reported to be under artesian pressure in the middle part of Goliad County (Dale, et al. 1957). The town of Goliad, which is located approximately 14-miles to the south of the permit area, utilizes municipal water supply wells producing from the Lagarto Clay.

Figures 6.20 and 6.21 (see Map Appendix C)

The Lagarto is underlain by the Oakville Sandstone. The Oakville generally comprises the Jasper Aquifer System and essentially is the base of the USDW in the proposed UEC Permit Area. The Oakville consists of up to 700 feet of cross-bedded sand and sandstone interbedded with lesser amounts of sandy, ashy, bentonitic clay (Dale, et al. 1957).

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Figure 6.22

UEC A Sand Potentiometric Surface

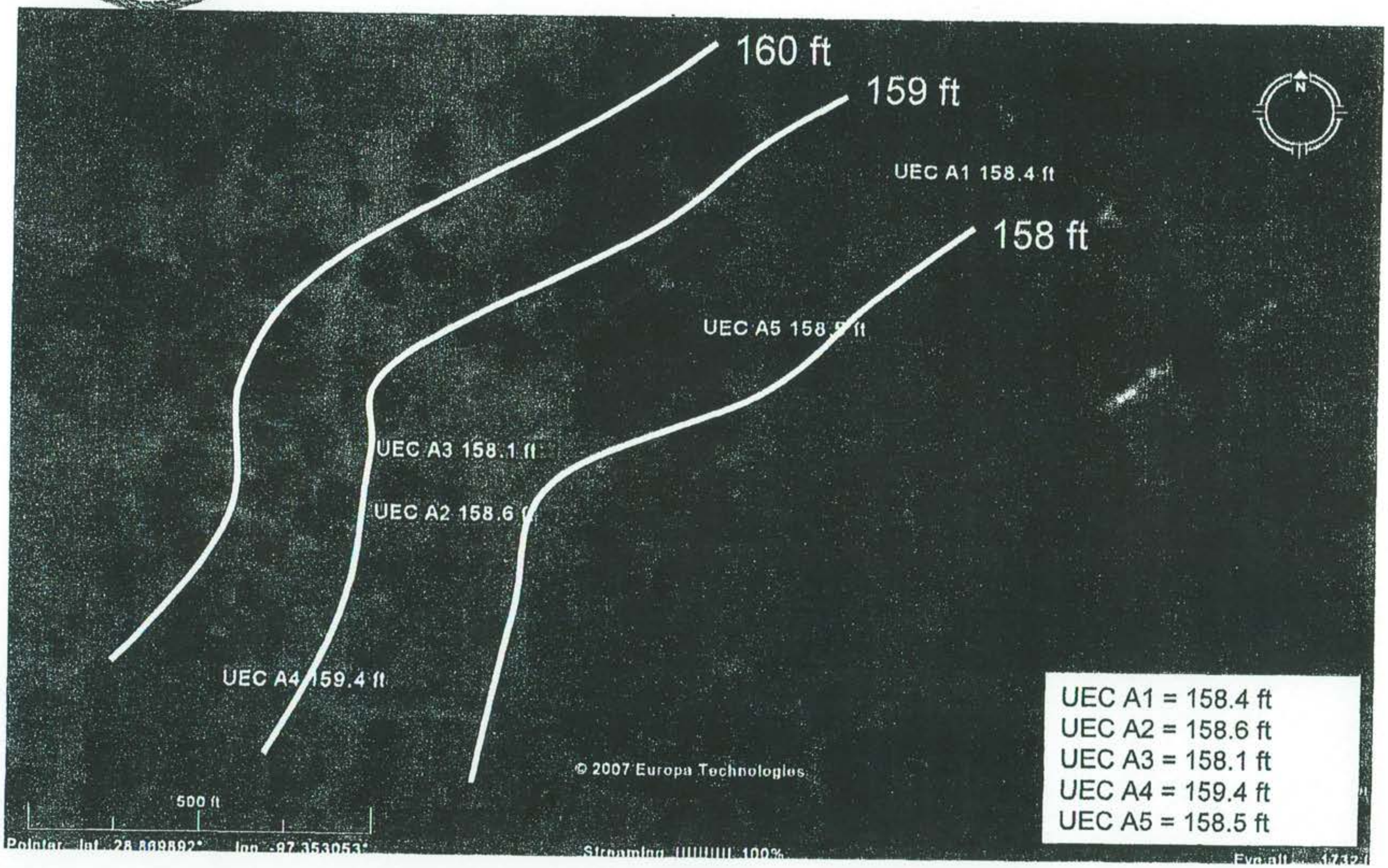

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Figure 6.22

UEC B Sand Potentiometric Surface

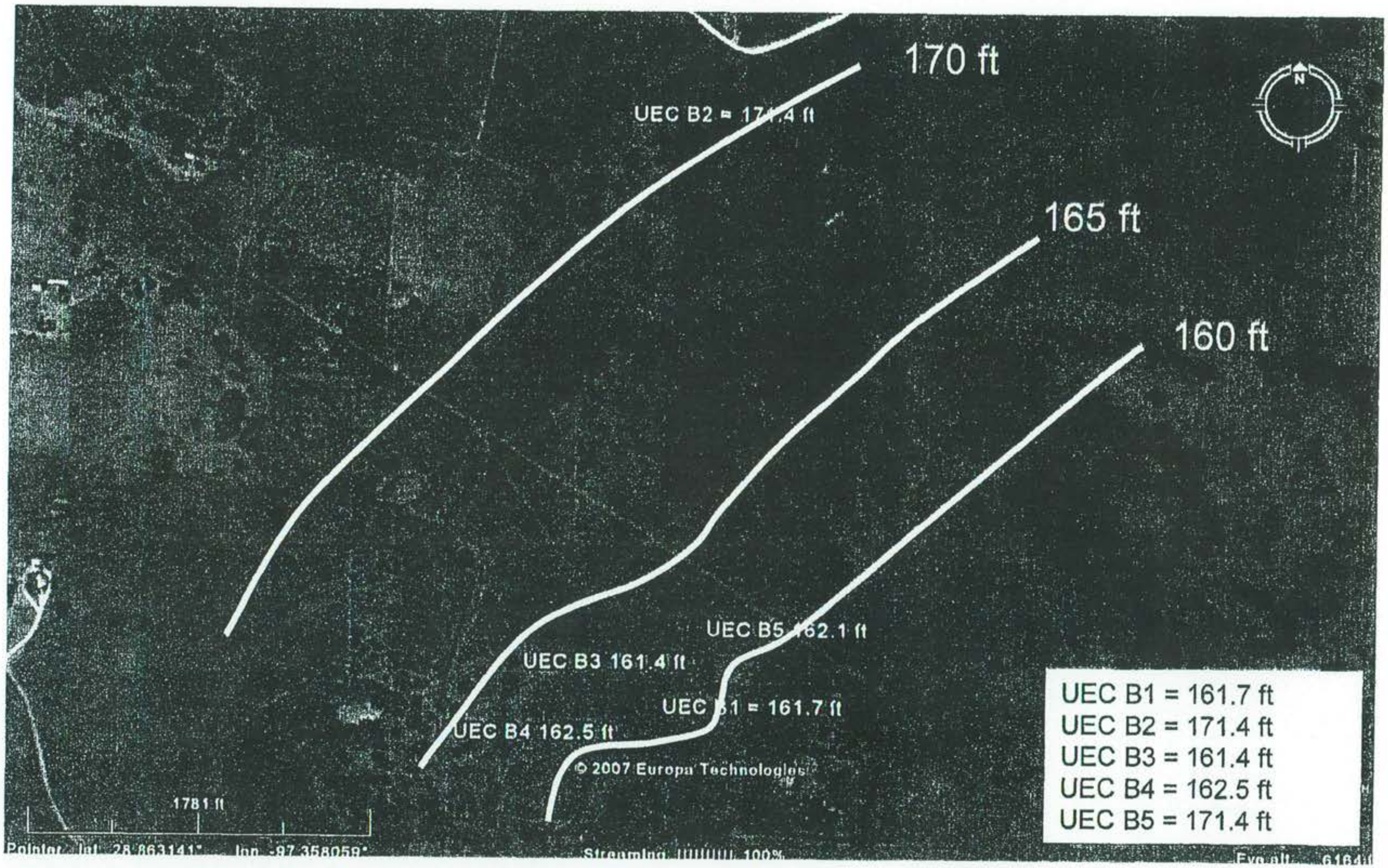

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Figure 6.22

UEC C Sand Potentiometric Surface

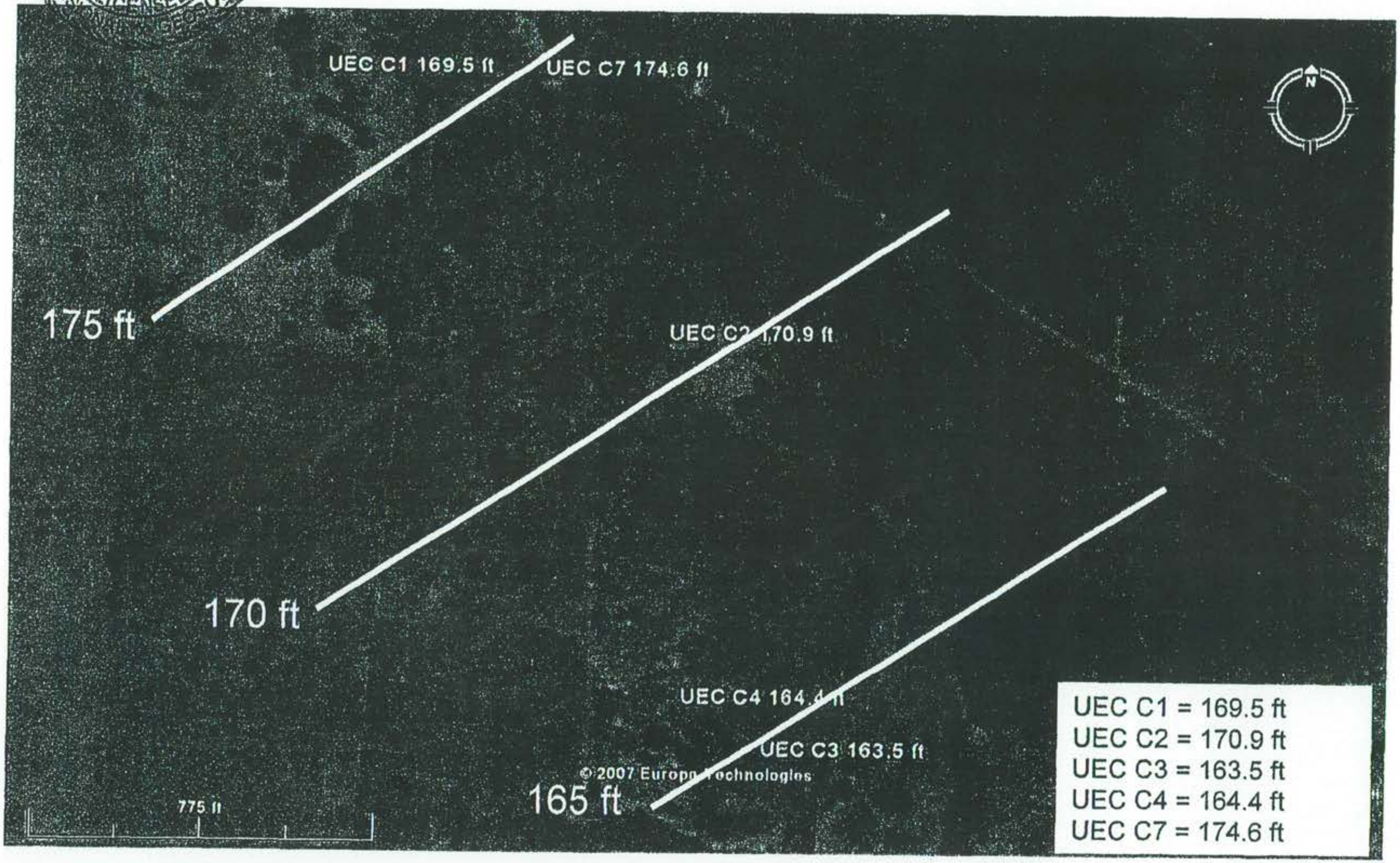

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Figure 6.22

UEC D Sand Updip Potentiometric Surface

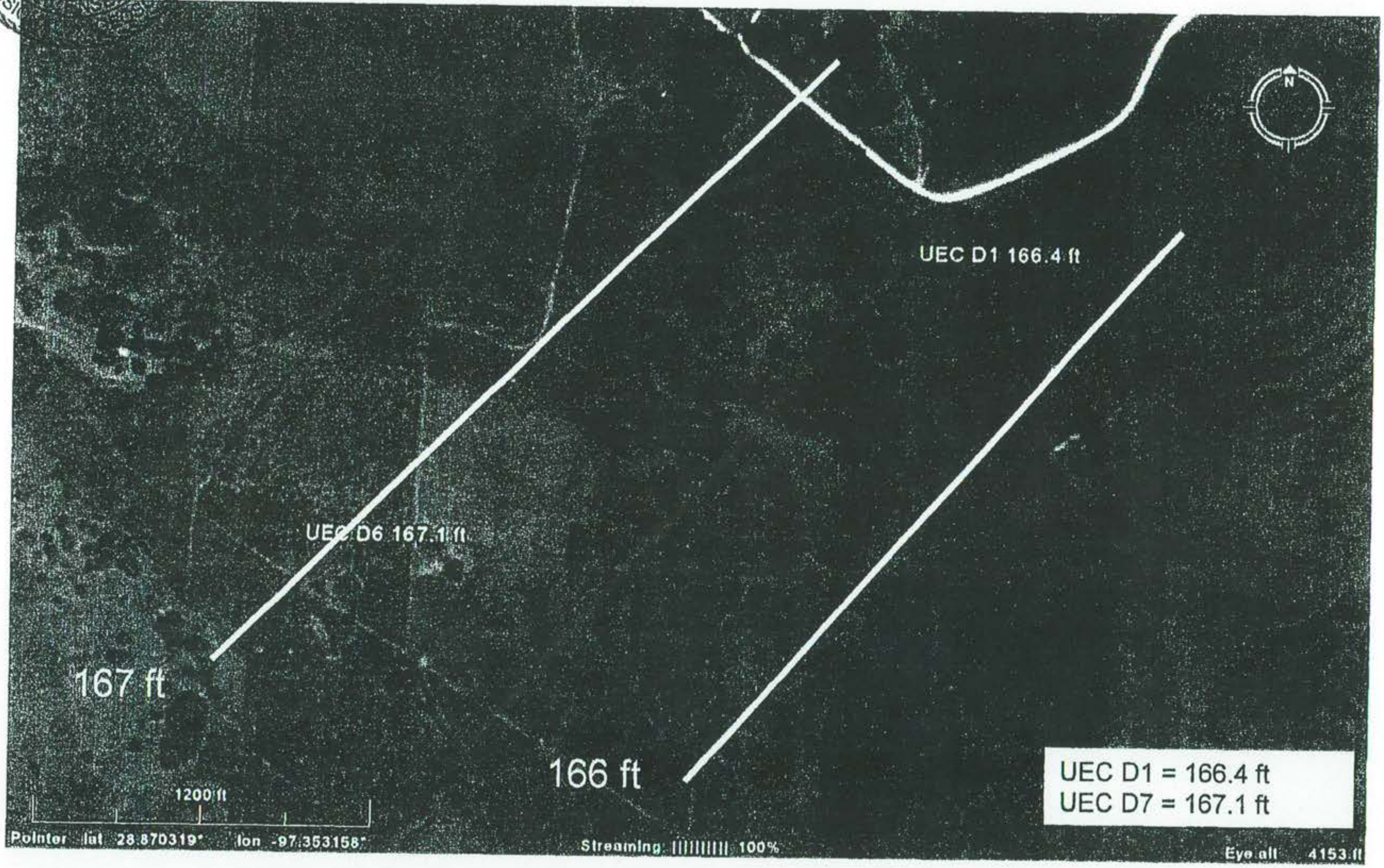

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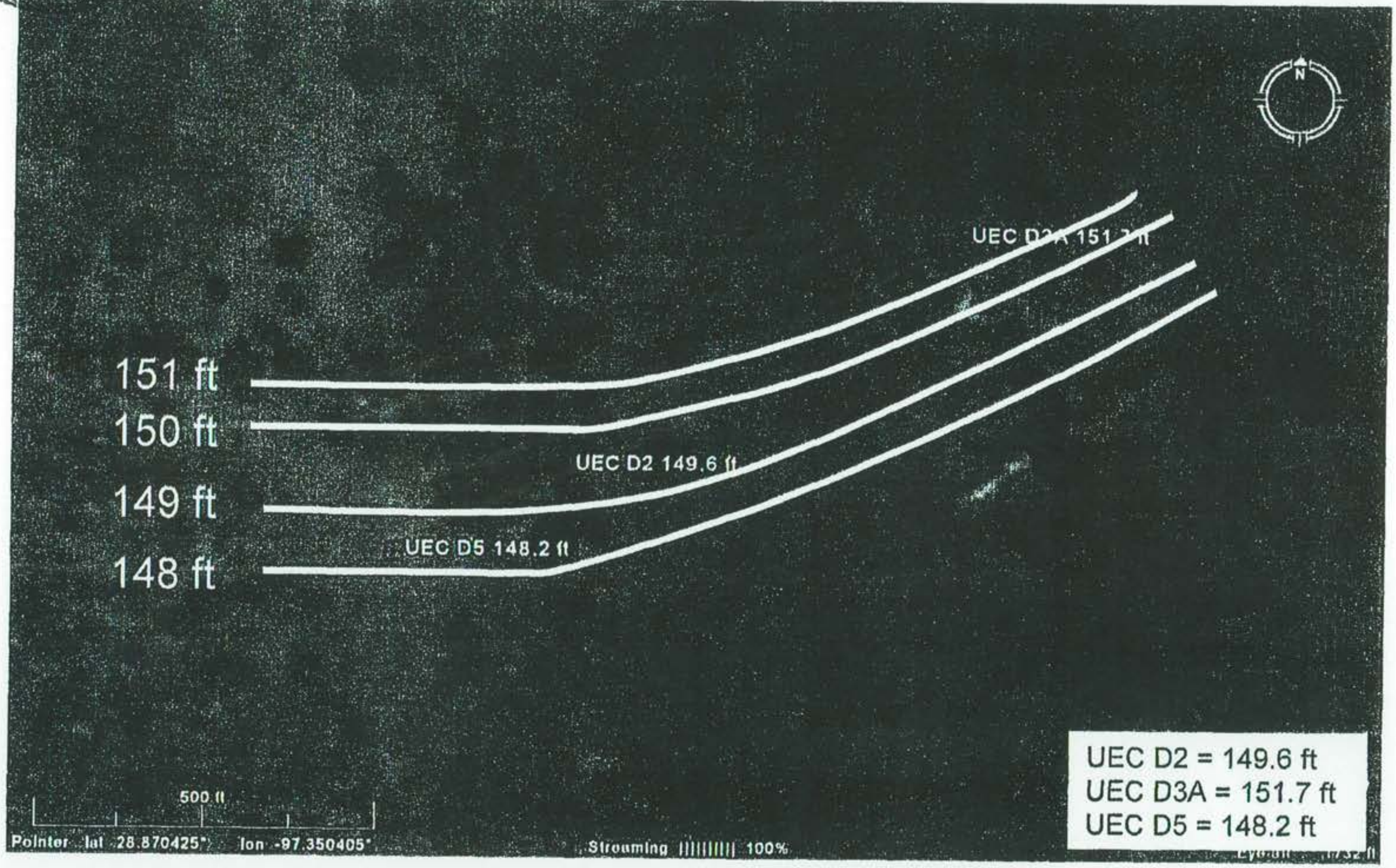
Figure 6.22

UEC D Sand Downdip Potentiometric Surface



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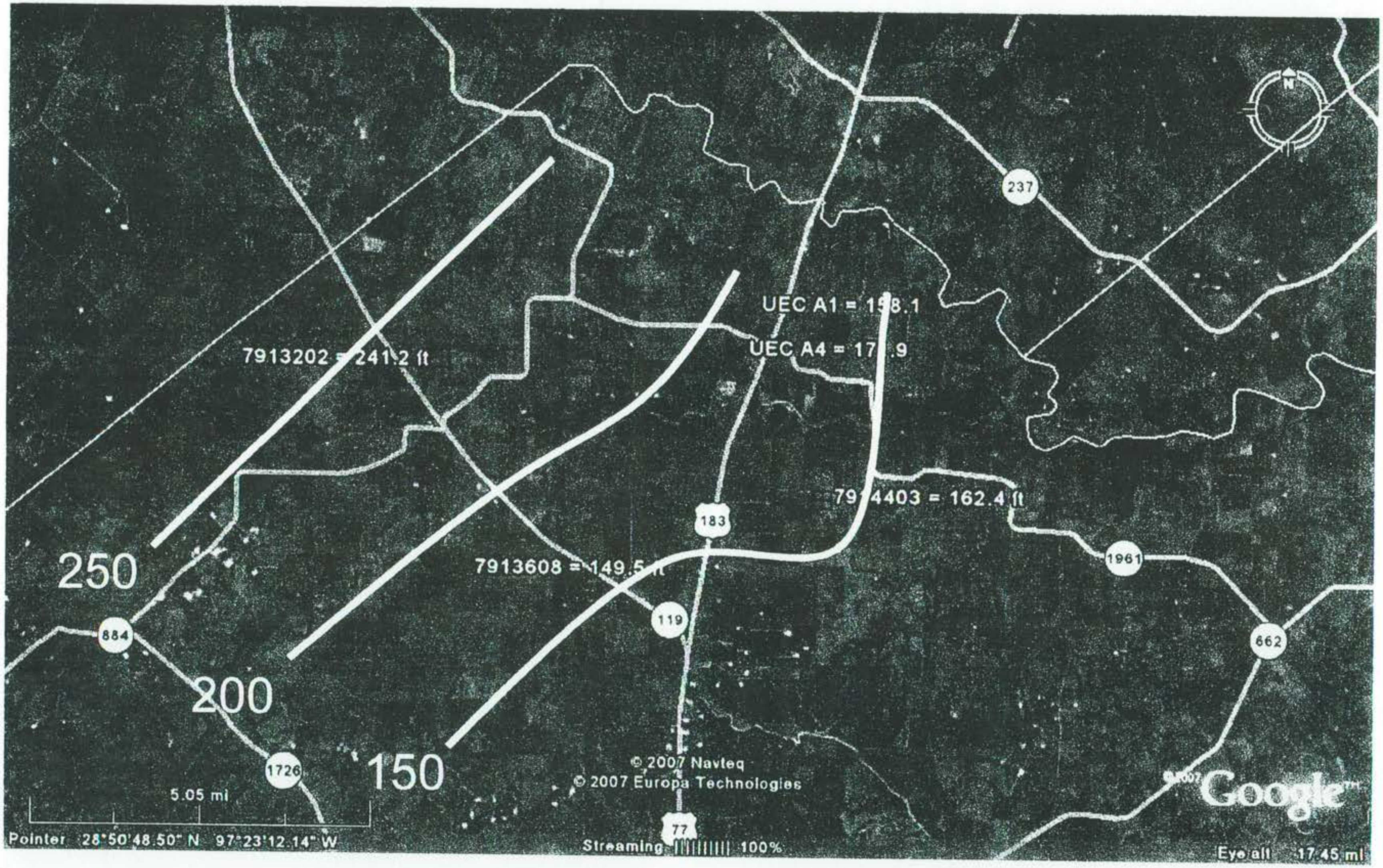

Figure 6.23 UEC regional potentiometric surface (feet). Data points: UEC A1 = 158.1 ft, UEC A4=171.9 ft
7913202 = 241.2 ft, 7914403=162.4 ft
7913608=149.5 ft

References:

Baker, E. T. Jr., 1979, Stratigraphic and Hydrogeologic Framework of Part of the Coastal Plain of Texas, Texas Department of Water Resources, Report 236, 43 pp.

Chowdhury, A. H., Wade, S., Mace, R. E., and Ridgeway, C., 2004, Groundwater Availability Model of the Central Gulf Coast Aquifer System - Numerical Simulations through 1999: Texas Water Development Board unpublished Report, 163pp.

Chowdhury, A. H., and Turco, M. J., 2006, Geology of the Gulf Coast Aquifer, Texas, in Mace, R. E., et al., editors, Aquifers of the Gulf Coast of Texas, Texas Water Development Board Report 365, p 23-51.

Dale, O. C., Moulder, E. A., and Arnow, T., 1957, Groundwater Resources of Goliad County, Texas, Texas Board of Water Engineers Bulletin 5711, 93 pp.

Hamlin, H.S., 1988, Depositional and Ground-Water Flow Systems of the Carrizo-Upper Wilcox, South Texas, The University of Texas at Austin, Bureau of Economic Geology, Report of Investigations No. 175, 61 pp.

Larkin, T. J., and Bomar, G. W., 1983, Climatic Atlas of Texas, Texas Department of Water Resources, Report LP-192, 151 pp.

Solis, R. F. I., 1981, Upper Tertiary and Quaternary Depositional Systems, Central Coastal Plain, Texas, Regional Geology of the Coastal Aquifer and Potential Liquid-Waste Repositories, The University of Texas at Austin, Bureau of Economic Geology, Report of Investigations No. 108, 89 pp.

Wermund, E.G, 1996, Physiographic Map of Texas, The University of Texas at Austin Bureau of Econmoic Geology found at: (www.beg.utexas.edu/UTopia/images/pagesizemaps/physiography.pdf)

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7.0 Geology

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7.0 Geology

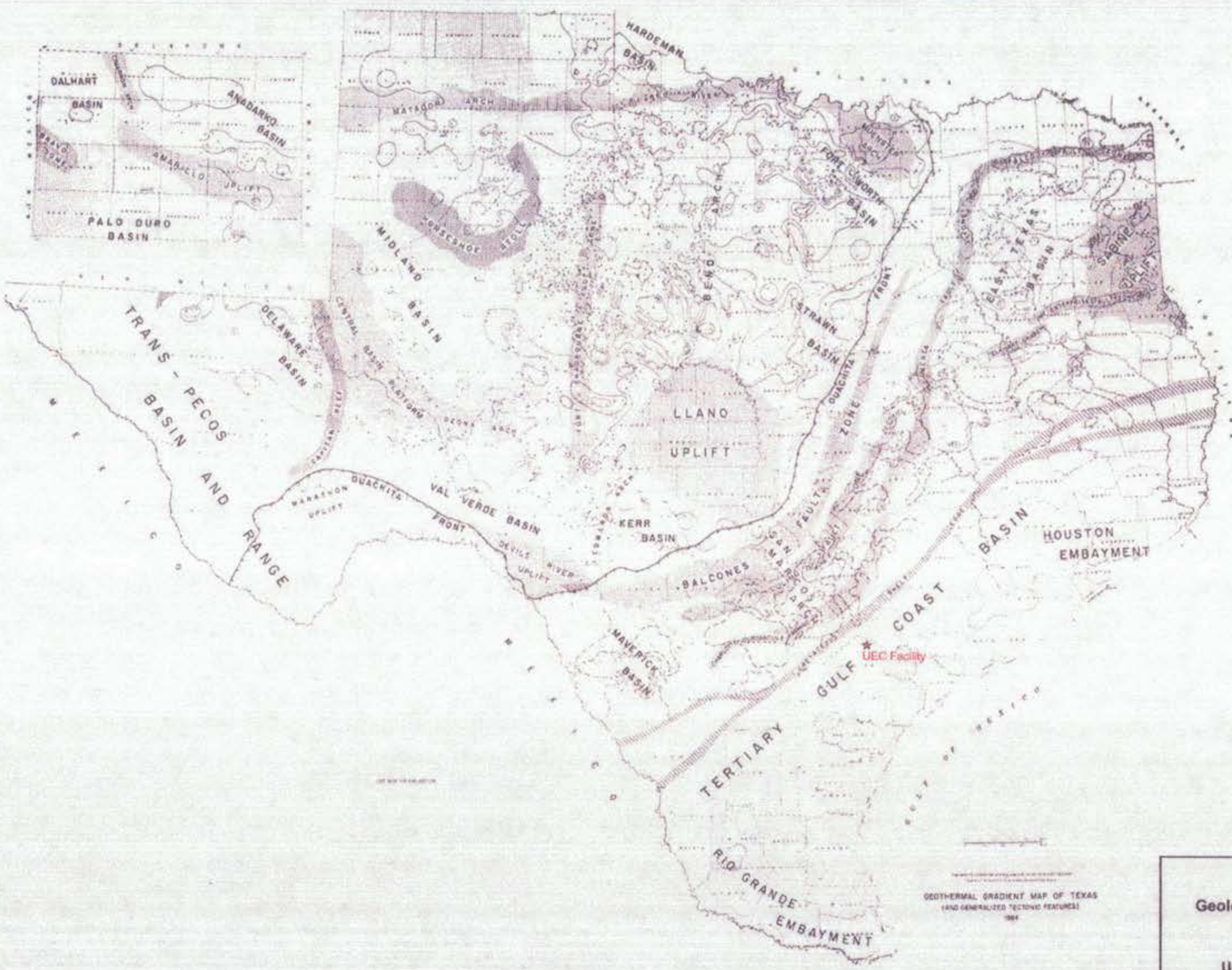
Section seven of the Permit Application Technical Report describes the regional and permit area stratigraphic and structural geology, and lithology, pertinent to the proposed uranium recovery project.

7.1 Regional Geology

UEC's proposed ISR operation is located in northern Goliad County within the Gulf Coast Basin geologic region of Texas (Figure 7.1). The Gulf Coast Basin is generally filled with a thick wedge of interbedded and intermixed Tertiary and Quaternary clastic deposits of fluvial, deltaic, and marine origin that were deposited within a slowly subsiding passive margin basin. The basin strata generally thicken and deepen toward the present Gulf of Mexico to approximately 30,000 feet of sediment thickness.

7.1.1 Regional Stratigraphy

The regional stratigraphy consists of Jurassic to Recent aged strata. The regional stratigraphy is shown on the stratigraphic column included as Figure 7.2. Figure 7.3 is a regional dip cross-section showing the stratigraphic relationships and general log character for stratigraphic intervals in the regional study area. Figures 7.4 and 7.5 are regional strike and dip cross-sections respectively showing the shallow geological interval (Miocene to the surface) in Goliad County which is more specific to UEC's Mine Permit Application. In the regional study area the Jurassic and Cretaceous strata lie at great depth (>10,000 feet MSL) and are not pertinent to this discussion. In general, the Jurassic strata consist of continental redbeds and evaporite deposits laid down contemporaneously with the rifting and subsequent thermal subsidence of the Gulf Coast Basin associated with the breakup of the Pangean supercontinent. The Cretaceous geological section is represented by numerous rock units in the Gulf Coast Basin (Figure 7.2). In general, Cretaceous sediments primarily consist of layered carbonates and clastics deposited during periods of high and low relative sea level respectively.



Source: Woodruff, C.M.Jr., Gever, C., Snyder, F.R., And Wuerch, D.R., 1983, Integration of Geothermal Data along the Balcones/Ouachita Trend, Central Texas, Report to the U.S. Department of Energy, Division of Geothermal Energy, Contract No. DE-AS07-79ID 12057 21 pp.

FIGURE 7.1

Geologic Regions of Texas

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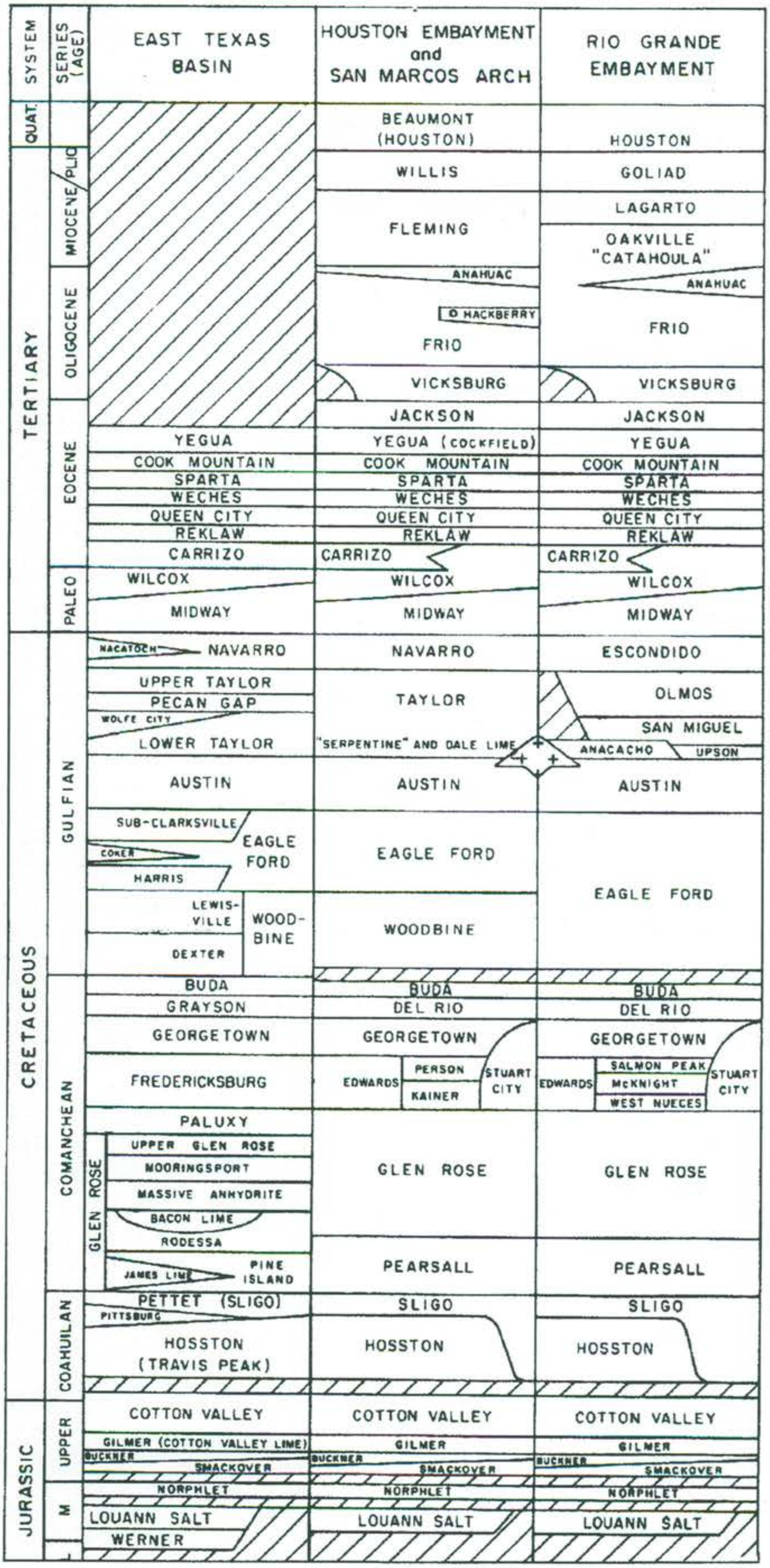

FIGURE 7.2

Regional Stratigraphic Column

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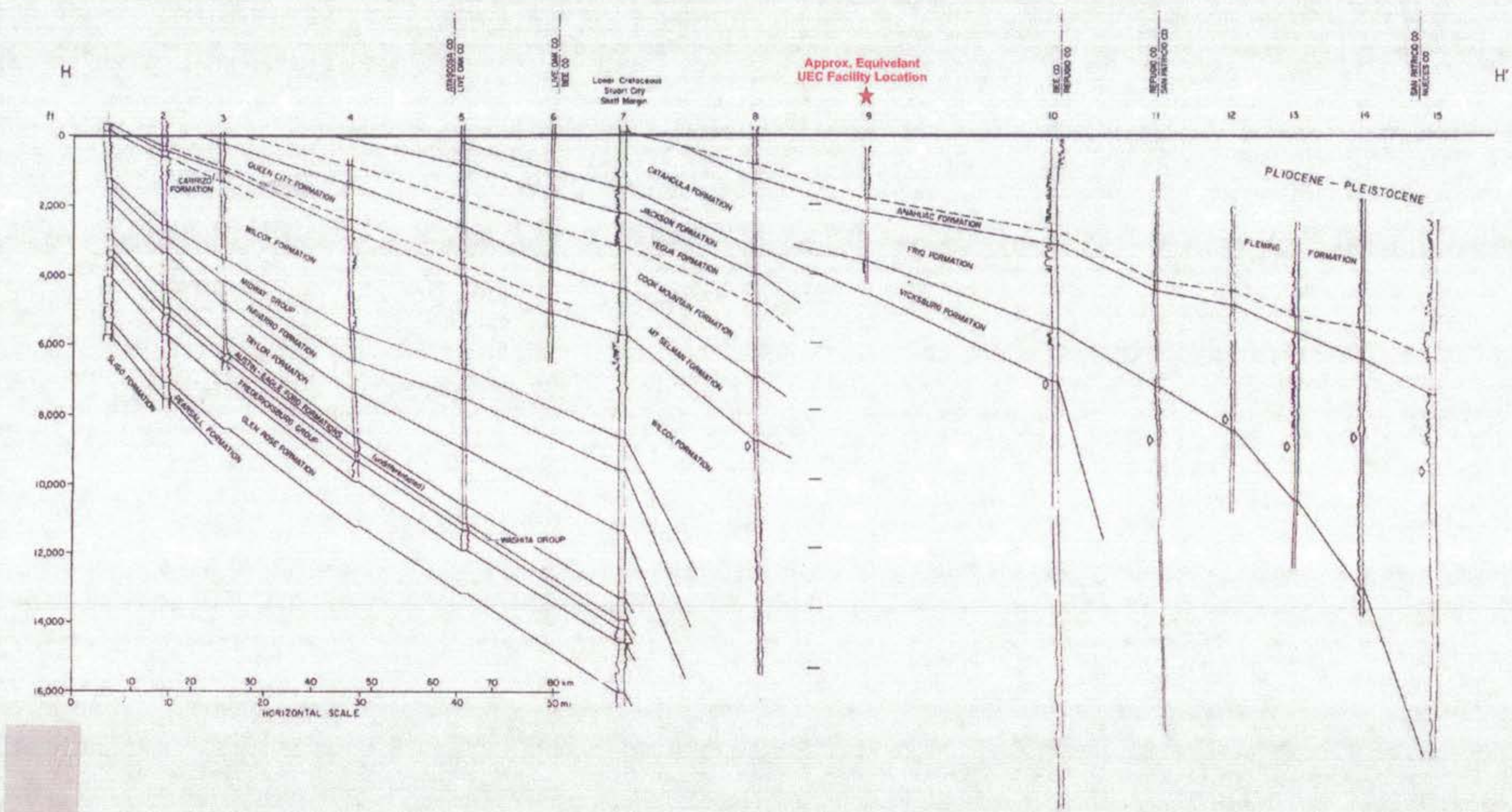

Source: Bebout, D. G., Weise, B. R., Gregory, A. R., and Edwards, M. B., 1982, Wilcox Sandstone Reservoirs in the Deep Subsurface Along the Texas Gulf Coast, Their Potential for Production of Geopressured Geothermal Energy, The University of Texas at Austin, Bureau of Economic Geology, Report of Investigations No. 117, 125 pp.

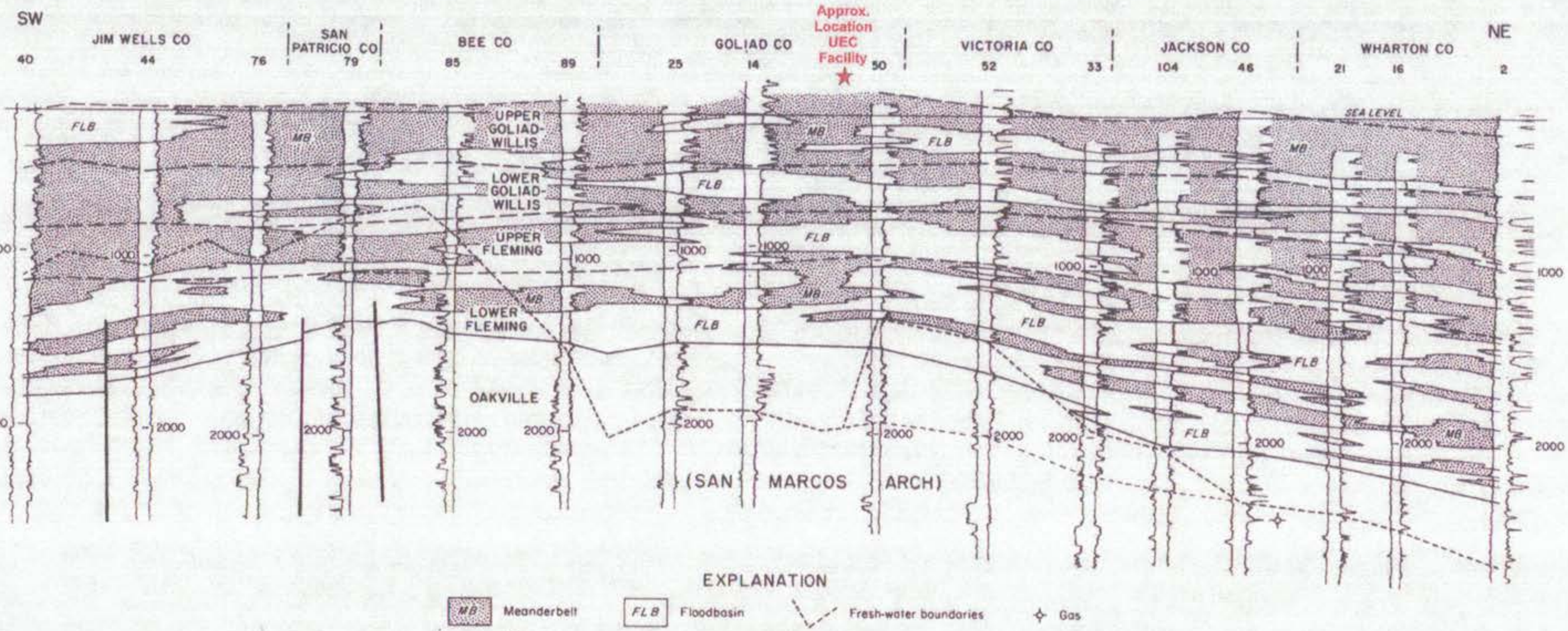

FIGURE 7.4
Regional Strike Oriented Cross Section
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Weeger-Eide & Associates, LLC	7/6/07
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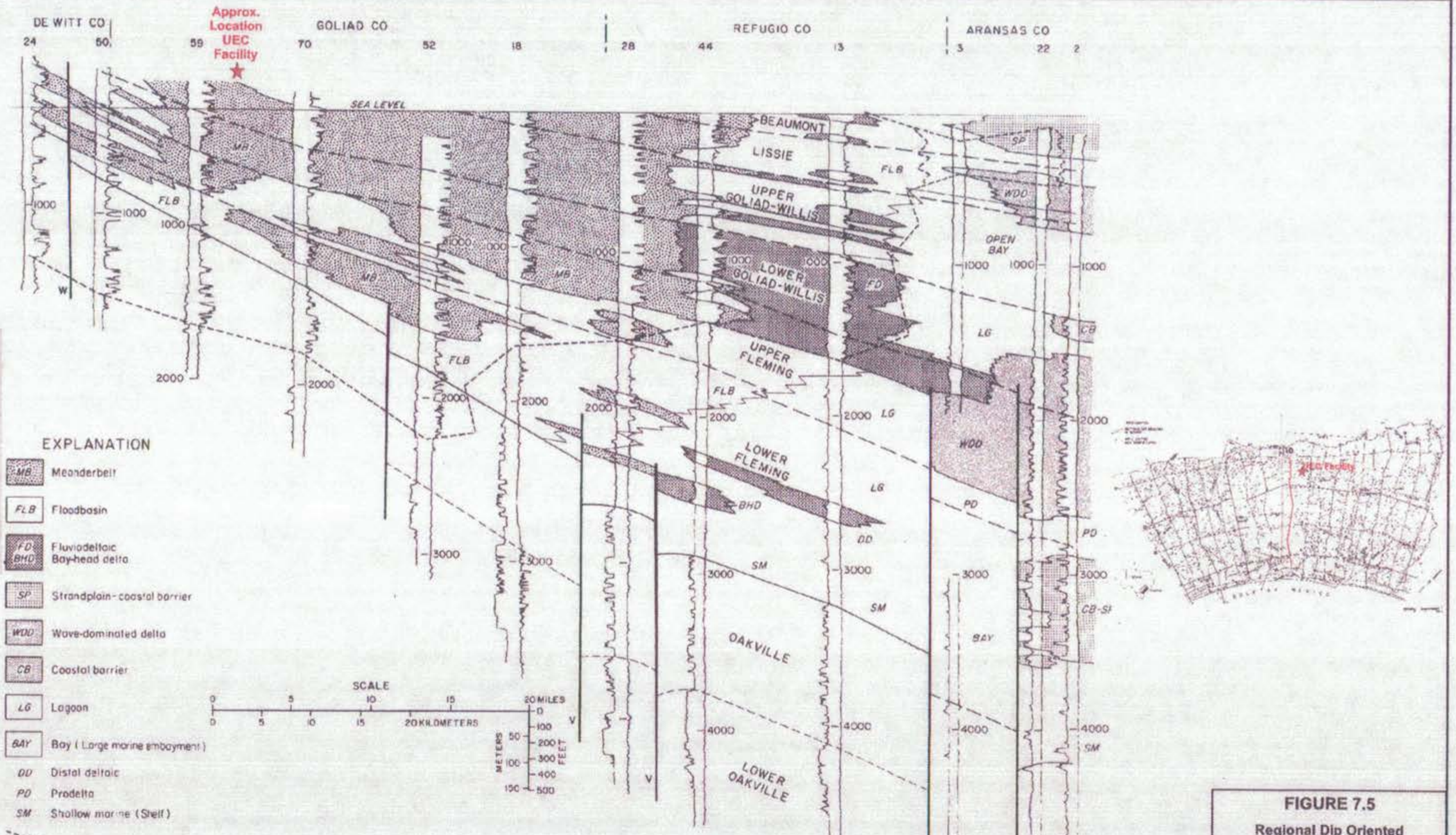
Source: Solis, R. F., 1981, Upper Tertiary and Quaternary Depositional Systems, Central Coastal Plain , Texas, Regional Geology of the Coastal Aquifer and Potential Liquid-Waste Repositories, The University of Texas at Austin, Bureau of Economic Geology, Report of Investigations No. 108.



Dip cross section 10. Fault data courtesy of Geomap. See Appendix D for well names.

Source: Solis, R. F., 1981, Upper Tertiary and Quaternary Depositional Systems, Central Coastal Plain , Texas, Regional Geology of the Coastal Aquifer and Potential Liquid-Waste Repositories, The University of Texas at Austin, Bureau of Economic Geology, Report of Investigations No. 108.

FIGURE 7.5

Regional Dip Oriented Cross Section

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The geometry of the Cretaceous shoreline in the Central Texas region was thought to resemble the current shoreline configuration. Late Cretaceous sedimentation in the Gulf Coast Basin is characterized by the drowning of reefs and extensive deposition of chalk, marls, and marine shales. In the central Texas area, Cretaceous rocks outcrop on the up thrown side of the Balcones Fault Zone (Figure 7.1) approximately 90 miles to the west and northwest of UEC's site.

The Tertiary System comprises a large part of the sediments occupying the Gulf Coast Basin. The oldest Tertiary rocks in the basin are the Paleocene Series Midway Group. The Midway Group generally consists of dense calcareous marine shales, which unconformably overlie older Cretaceous strata.

Transgression and regression of the Midway Sea was followed by widespread deposition of the upper Paleocene to lower Eocene aged Wilcox Group clastics (Waters, et al., 1955). The Wilcox consists of complexly interbedded sands, silts, and shales that thicken significantly from west to east. The Wilcox Group sediments are fluvial and deltaic deposits from source material associated with the Laramide orogeny. In the vicinity of the project site, the Wilcox sediments are primarily thought to be deltaic in origin.

The Carrizo Sand of lower Eocene age overlies the Wilcox Group. Although the Carrizo Formation, which is non-marine (fluvial) in origin, is discernible in the outcrop, the down dip Carrizo is indistinguishable from the upper Wilcox (Hamlin, 1988). In the vicinity of the UEC's site, the Wilcox and Carrizo are undifferentiated and the top of the Wilcox/Carrizo occurs at an approximate elevation of –8,000 feet mean sea level (msl).

The Eocene aged Claiborne Group unconformably overlies the Wilcox/Carrizo Group. The Claiborne Group generally consists of interbedded clastics of fluvial, deltaic, marginal marine and marine origin. In the regional study area, the Claiborne Group consists of (from oldest to youngest): 1) Reklaw Formation – marine shales; 2) Queen City Formation – deltaic sands, silts, and shales; 3) Weches Formation – marine shales;

4) Sparta Formation – deltaic and marginal marine sands, silts, and shales; Cook Mountain Formation – glauconitic sands and marine shales; and 5) Yegua Formation – deltaic and marginal marine sands, silts, and shales (Waters, et al., 1955). For the purpose of this study, the Claiborne Group is undivided.

The upper Eocene Jackson Group overlies the Claiborne Group in the regional study area. The Jackson Group consists predominantly of marine shale and marl in southeast Texas with the percentage of sandstone increasing southwestward (Waters, et al., 1955). The Jackson Group can be subdivided into five formations which are (from oldest to youngest): 1) Moody's Branch Formation; 2) Caddell Formation; 3) Wellborn Formation; 4) McElroy Formation; and 5) Whitsett Formation. However, in the regional study area the Jackson Group is undivided.

The lower Oligocene-aged Vicksburg Group, aka Vicksburg Formation, overlies the Jackson Group in the regional study area. The Vicksburg Group consists of fluvial, deltaic and marginal marine deposits comprised of sand, silt, and clay. In the vicinity of the project site the Vicksburg Group strata are interpreted as shallow marine strand plain deposits derived from longshore drift (Combs, 1993).

The upper Oligocene Catahoula Group unconformably overlies the Vicksburg Group. In the regional study area the Catahoula Group can be subdivided into the three formations, which are from oldest to youngest: 1) Frio Formation, 2) Anahuac Formation, and 3) Catahoula Tuff Formation. The Frio Formation consists of consists of predominantly shale with some interbedded sands in the upper part of the formation. The Anahuac Formation consists predominantly of marine shale. The Catahoula Tuff consists of predominantly of shale with some interbedded tuffaceous sands which are predominantly found in discontinuous lenses.

The Miocene Fleming Group overlies the Catahoula Group. In the regional study area, the Fleming Group can be subdivided into a lower Oakville (Sandstone) Formation and upper Lagarto (Clay) Formation. In general, the Oakville Formation consists of sands with lesser amounts of silts and clays and comprises the base of the lowermost underground source of drinking water (USDW).

The Lagarto Formation overlies the Oakville and consists predominantly of clay with minor amounts of sand and silt. The sands in the Lagarto are most common in the upper and lower parts of the formation in Goliad County (Dale, et al., 1957).

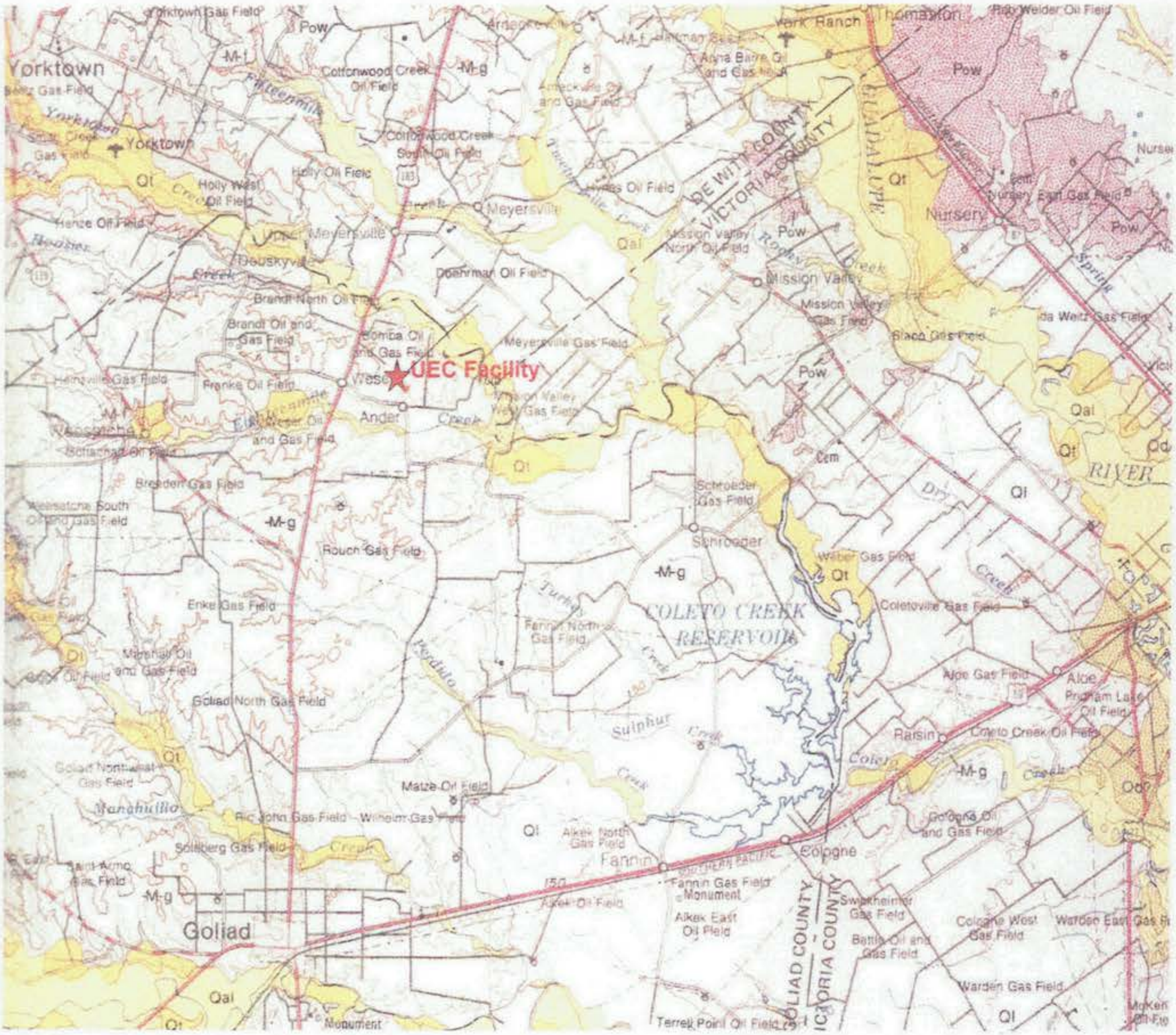
The Pliocene aged Goliad Formation overlies the Fleming Group and outcrops at the surface in the Regional study area (Figure 7.6). The Goliad consists predominantly of sandstone and sand with interbedded gravel, silt, and clay. The sand and gravel are often impregnated and cemented with caliche (Dale, et al., 1957).

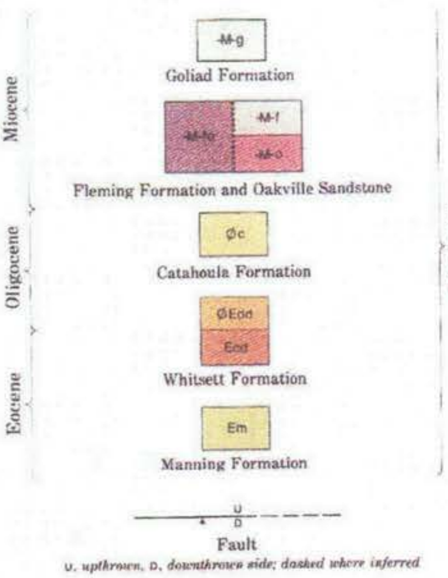
7.1.2 Regional Structural Geology

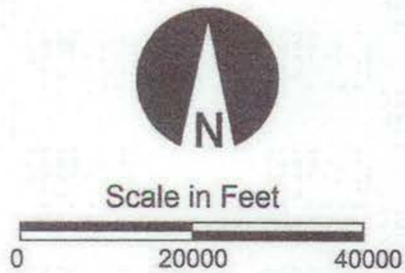
UEC's project site in northern Goliad County lies within the Gulf Coast Basin geologic region of Texas (Figure 7.1). The basin is part of the larger Gulf of Mexico Basin, which was formed by down warping and rifting of Paleozoic basement rocks during the breakup of the Paleozoic super-continent Pangea, during the Late Triassic period. Figure 7.7 is a schematic representation of the Gulf of Mexico Basin indicating the geographic extent of the basin and showing significant substructures within the basin (Salvador, 1991).

Initial sedimentation within the basin consisted of synrift clastic deposits and evaporites of Jurassic age. This was followed by deposition of a thick section of predominantly carbonate rocks in the early and middle Cretaceous Period. The late Cretaceous and Tertiary were characterized by a thick wedge of clastic deposits of fluvial, deltaic, and marine origin. The source of the sediments was from the west-northwest and associated with the Laramide orogeny and subsequent erosion from the ancestral and recent Rocky Mountains.

In the central Texas area, the Balcones Fault Zone generally forms the outer rim of the Gulf Coast Basin. The Balcones Fault Zone generally trends parallel to the structural fabric of the older Ouachita Orogenic Belt in a general southwest to northeast direction.







Source: Barnes, V. E., 1975, Geologic Atlas of Texas Beeville-Bay City Sheet.

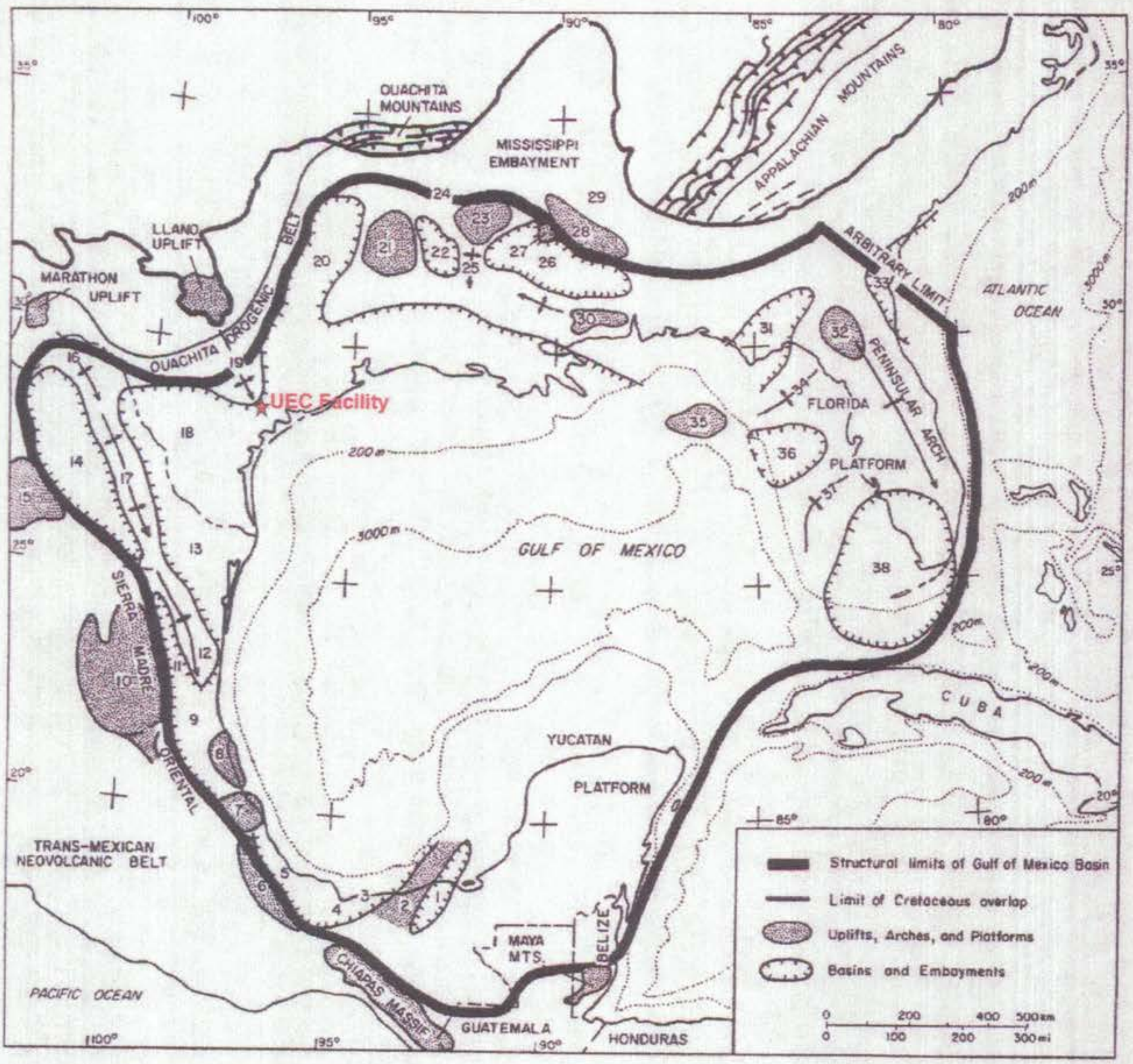
FIGURE 7.6

Regional Geologic Map

Prepared For:

Uranium Energy Corp

DRAWN BY:	DATE:
Weegar-Eide & Associates, LLC	7/5/07
DRAWING NO:	SCALE:
Fig 7-6.cdr	See Scale Bar



Structures in the Gulf of Mexico Basin include the: (1) Macuspana basin, (2) Villahermosa uplift, (3) Comalcalco basin, (4) Isthmus Saline basin, (5) Veracruz basin, (6) Cordoba platform, (7) Santa Ana massif, (8) Tuxpan platform, (9) Tampico-Misantla basin, (10) Valles-San Luis Potosi platform, (11) Magiscatzin basin, (12) Tamapulias arch, (13) Burgos basin, (14) Sabinas basin, (15) Cohuila platform, (16) El Burro uplift, (17) Peoytes-Picachos arches, (18) Rio Grande embayment, (19) San Marcos arch, (20) East Texas basin, (21) Sabine uplift, (22) North Louisiana salt basin, (23) Monroe uplift, (24) Desha basin, (25) La Salle arch, (26) Mississippi salt basin, (27) Jackson dome, (28) Central Mississippi deformed belt, (29) Black Warrior basin, (30) Wiggins uplift, (31) Apalachicola embayment, (32) Ocala uplift, (33) Southeast Georgia embayment, (34) Middle Ground arch, (35) Southern platform, (36) Tampa embayment, (37) Sarasota arch, and (38) South Florida basin (from Salvador, 1991).

FIGURE 7.7

Geographic Extent and Structural Regions in the Gulf of Mexico Basin

Prepared For:

Uranium Energy Corp

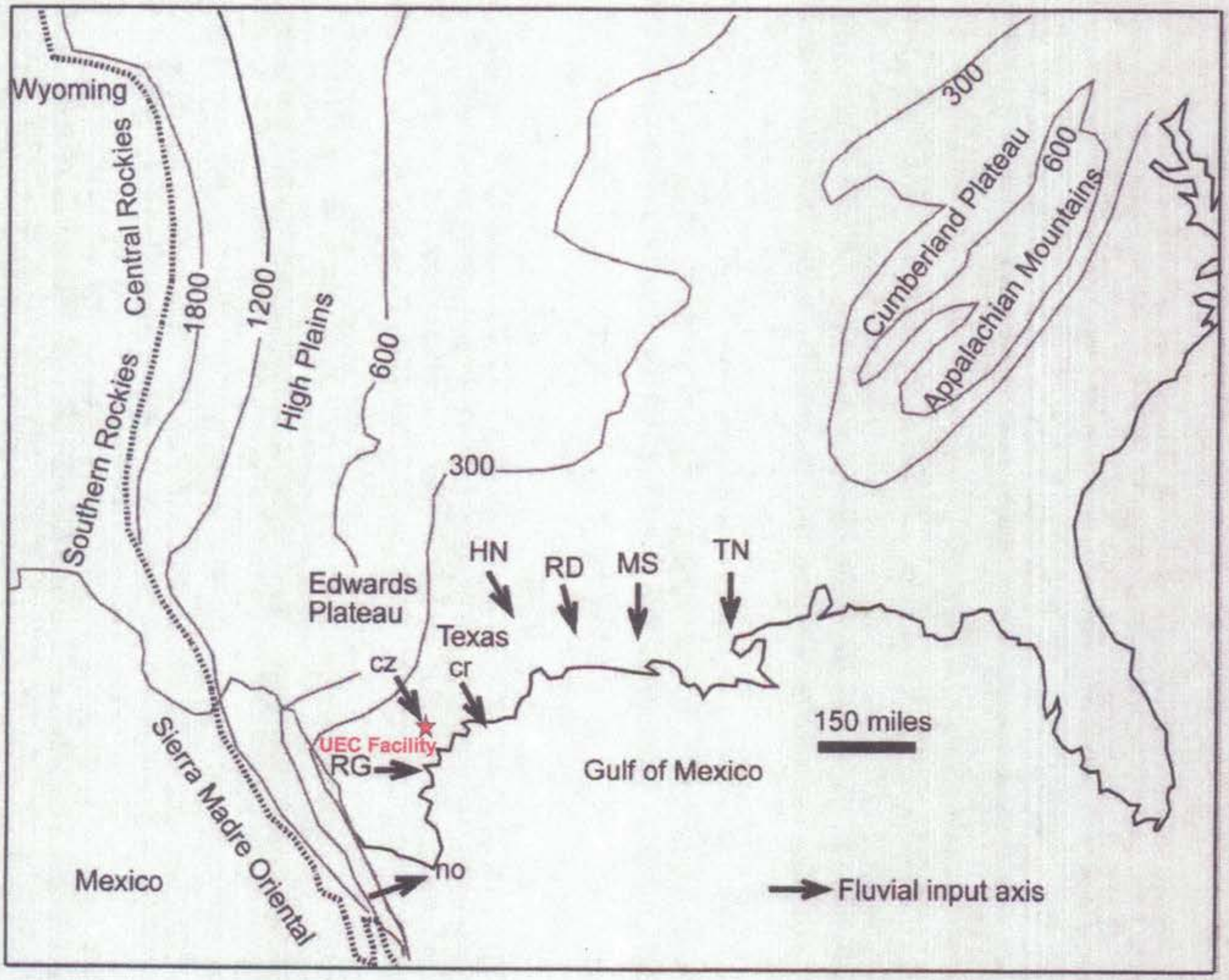
DRAWN BY: Weegar-Eide & Associates, LLC	DATE: 7/5/07
DRAWING NO: Fig 7-7.cdr	SCALE: See Scale Bar

Source: Salvador, A., 1991, Introduction, in Salvador, A., editor, The Gulf of Mexico Basin: Geological Society of America, The Geology of North America, vol. J, p 1-12.

A structural high known as the San Marcos Arch extends perpendicular to the fault trend into the Texas Gulf Coast Basin and generally separates the basin into to two sub-basins or embayments known as the Rio Grande Embayment (to the south) and the Houston Embayment (to the north) (Figures 7.1 and 7.7). The San Marcos Arch is an area of lesser subsidence and is a subsurface extension of the Llano Uplift (Chowdhury and Turco, 2006). The arch may be a basement fold associated with tectonic stresses manifested during the Ouachita Orogeny. The regional study area generally lies to the southeast, or down dip, of the San Marcos Arch in the Texas Gulf Coast Basin between the Rio Grande and Houston Embayments (Figure 7.7).

The Texas Gulf Coast Basin contains a thick wedge of Tertiary clastic sediment from source areas to the northwest. The sediments were predominantly deposited by fluvial and deltaic processes and were sometimes reworked in shallow marine and/or deep marine depositional environments. The principal sediment dispersal systems for Cenozoic sediments in the Gulf Coast Basin are shown on Figure 7.8. The relatively high rate of clastic sediment influx into the basin resulted in the formation of growth faults which are down to the coast normal faults that are thought to form contemporaneously with deposition. Growth fault development is thought to be generated by differential compaction in combination with the accumulation of excessive thickness of overburden sediment typically expected near deltaic depositional systems. In general, growth faults are listric (curved) in geometry, have throws that increase with depth, and strata are thicker on the downthrown side. Several major growth fault zones generally parallel the present coastline as indicated in Figure 7.9. UEC's project site lies within the Wilcox growth fault zone. Figure 7.10 is a generalized cross-section showing the depositional and structural style of the Tertiary section in the Texas Gulf Coast Basin in the regional study area. The cross-section illustrates how the growth fault zones get progressively younger moving into the basin and are characterized by sand rich depocenters especially on the downthrown side of the major faults (Solis, 1981).

Salt and shale diapers are also common structural features within the Texas Gulf Coast Basin. Viscous flow of ductile salt and shale can occur in response excessive overburden pressure and abnormal pore pressure due to rapid burial.



Principal sediment dispersal systems for the Cenozoic sediments of the Gulf of Mexico basin. Contours (in feet) indicate modern elevations of the uplands. Fluvial axes no=Norias, RF=Rio Grande, cz=Carrizo, cr=Corsair, HN=Houston, RD=Red River, MS=Mississippi, TN=Tennesse (after Galloway, 2005).

Source: Chowdhury, A. H., and Turco, M. J., 2006, Geology of the Gulf Coast Aquifer, Texas, in Mace, R. E., et al., editors, Aquifers of the Gulf Coast of Texas, Texas Water Development Board Report 365, p 23-51.

FIGURE 7.8 Principal Sediment Dispersal Systems for Cenozoic Sediments in the Gulf of Mexico Basin Prepared For: Uranium Energy Corp	
DRAWN BY: Weegar-Eide & Associates, LLC	DATE: 7/5/07
DRAWING NO: Fig 7-8.cdr	SCALE: See Scale Bar

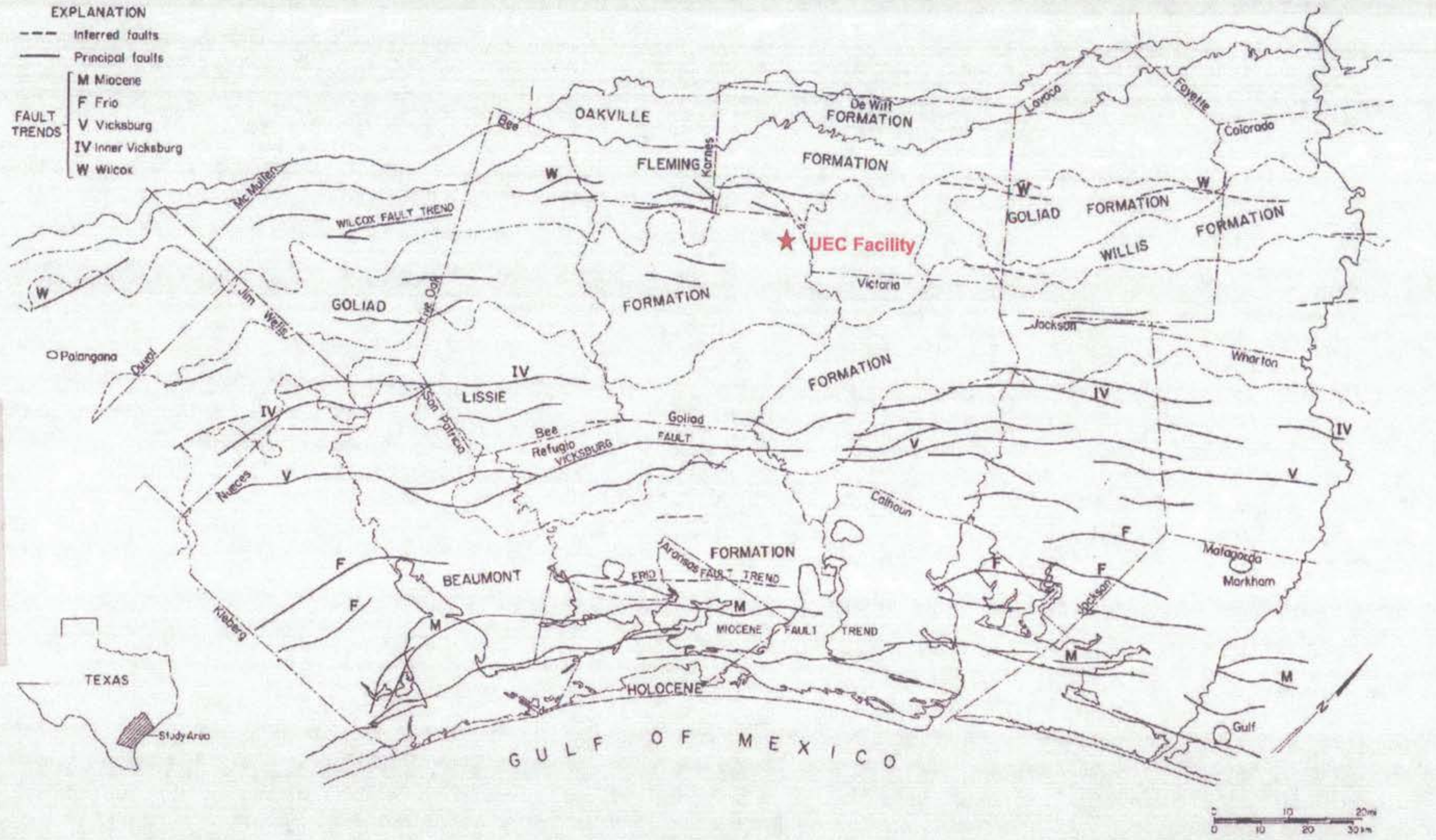


FIGURE 7.9

Map Showing Location of Major Growth Fault Zones in Texas Gulf Coast Basin

Prepared For:

Uranium Energy Corp

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Weegar-Eide & Associates, LLC	7/5/07
DRAWING NO:	SCALE:
Fig 7-9.cdr	See Scale Bar

Source: Solis, R. F. I., 1981, Upper Tertiary and Quaternary Depositional Systems, Central Coastal Plain, Texas, Regional Geology of the Coastal Aquifer and Potential Liquid-Waste Repositories, The University of Texas at Austin, Bureau of Economic Geology, Report of Investigations No. 108, 89 pp.

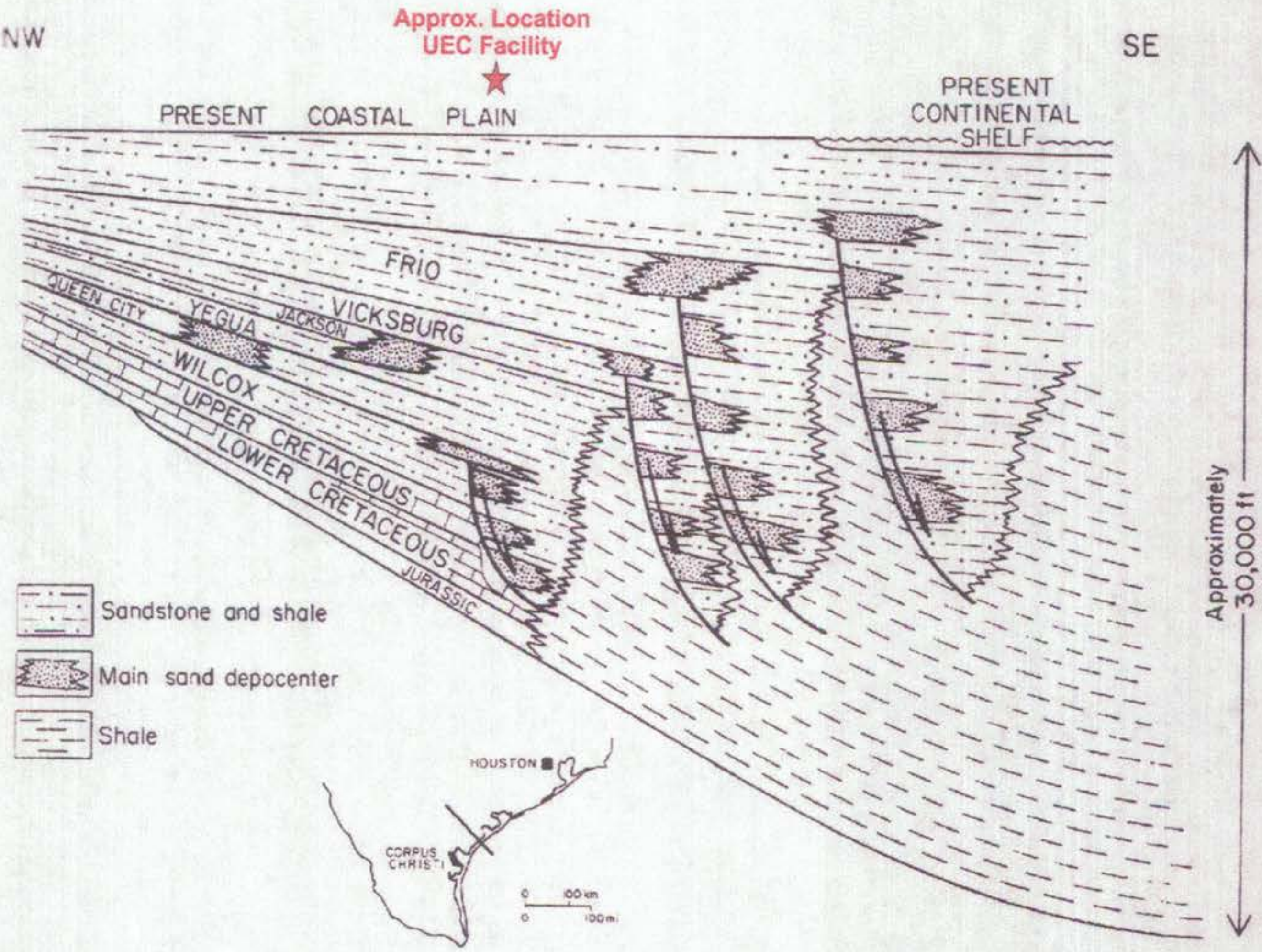

FIGURE 7.10

Cross-Section Showing Depositional and Structural Style within the Texas Gulf Coast Basin

Prepared For:

Uranium Energy Corp

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Weegar-Eide & Associates, LLC	7/6/07
DRAWING NO:	SCALE:
Fig 7-10.cdr	See Scale Bar

Source: Bebout, et al., 1982, Wilcox Sandstone Reservoirs in the Deep Subsurface along the Texas Gulf Coast, University of Texas at Austin Bureau of Economic Geology Report of Investigations No. 117.

However, no significant diapers are recognized in the regional study area. Salt domes are more common in the northern portion (Houston Embayment) of the Texas Gulf Coast Basin than in the southern portion (Rio Grande Embayment) (Figure 7.11) (Chowderhury and Turco, 2006).

7.1.3 Regional Seismic Activity

The Gulf Coast Basin is a relatively innocuous area with regard to seismic activity. As indicated on the seismic risk map for the United States (Figure 7.12), the Texas Gulf Coast Basin is a very stable area with regard to historical and potential seismic activity. In general, the central and southeast U.S. region encompasses a large area of relatively diffuse, low rate seismicity. Principal areas of activity include the New Madrid Seismic Zone, the East Tennessee, and Southern Appalachian Seismic Zones, and South Carolina. Due to the relatively low rate of seismicity, ground cover, deep soil, etc, most faults within the region are not even mapped. Even the precise location of faults within the New Madrid Seismic Zone is subject to debate (NEIC, 2007). A search of the NEIC historical database information was conducted for the period from 1900 to 2007 within a 50 km circular radius of UEC's permit area. The search identified no seismic events from the multiple databases searched within a 50 km radius of the search coordinates (28.867N; 97.351W).

7.2 Permit Area Geology

As indicated in previously referenced Figures 7.3 and 7.6, the permit area is located within the outcrop of the Goliad Sand. The Goliad Sand generally consists of up to 500 feet of light colored sand and sandstone (typically impregnated with caliche) interbedded with clay and gravel. In Goliad County, the subsurface strata generally strike from southwest to northeast and dip to the southeast at approximately 20 feet/mile near the outcrop, and up to 70 feet/mile away from the outcrop (Dale, et al., 1957).

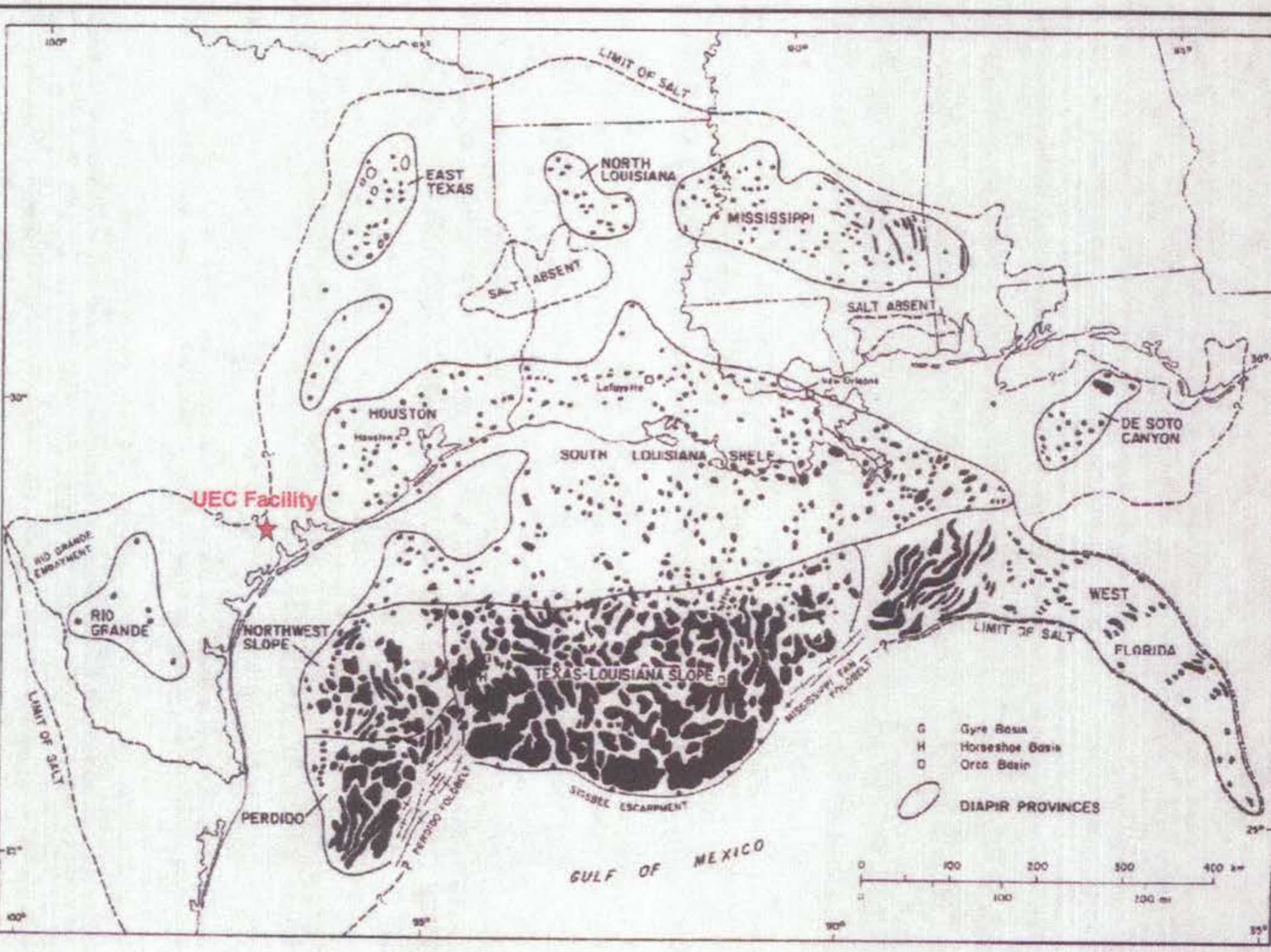

Figure 2-9. Map showing locations of salt deposits in the Gulf of Mexico basin (from Ewing, 1991). Note distribution of salt in the Rio Grande embayment, northeastern part of the Texas Gulf Coast including Houston area, and East Texas. Salt deposits occupy a much wider area in the offshore, in the northwest slope and Texas-Louisiana slope of the Gulf of Mexico basin.

Source: Chowdhury, A. H., and Turco, M. J., 2006, Geology of the Gulf Coast Aquifer, Texas, in Mace, R. E., et al., editors, Aquifers of the Gulf Coast of Texas, Texas Water Development Board Report 365, p 23-51.

FIGURE 7.11

Map Showing Locations of Salt Deposits in the Gulf of Mexico Basin

Prepared For:

Uranium Energy Corp

DRAWN BY:	DATE:
Weegar-Eide & Associates, LLC	7/8/07
DRAWING NO: Fig 7-11.cdr	SCALE: See Scale Bar

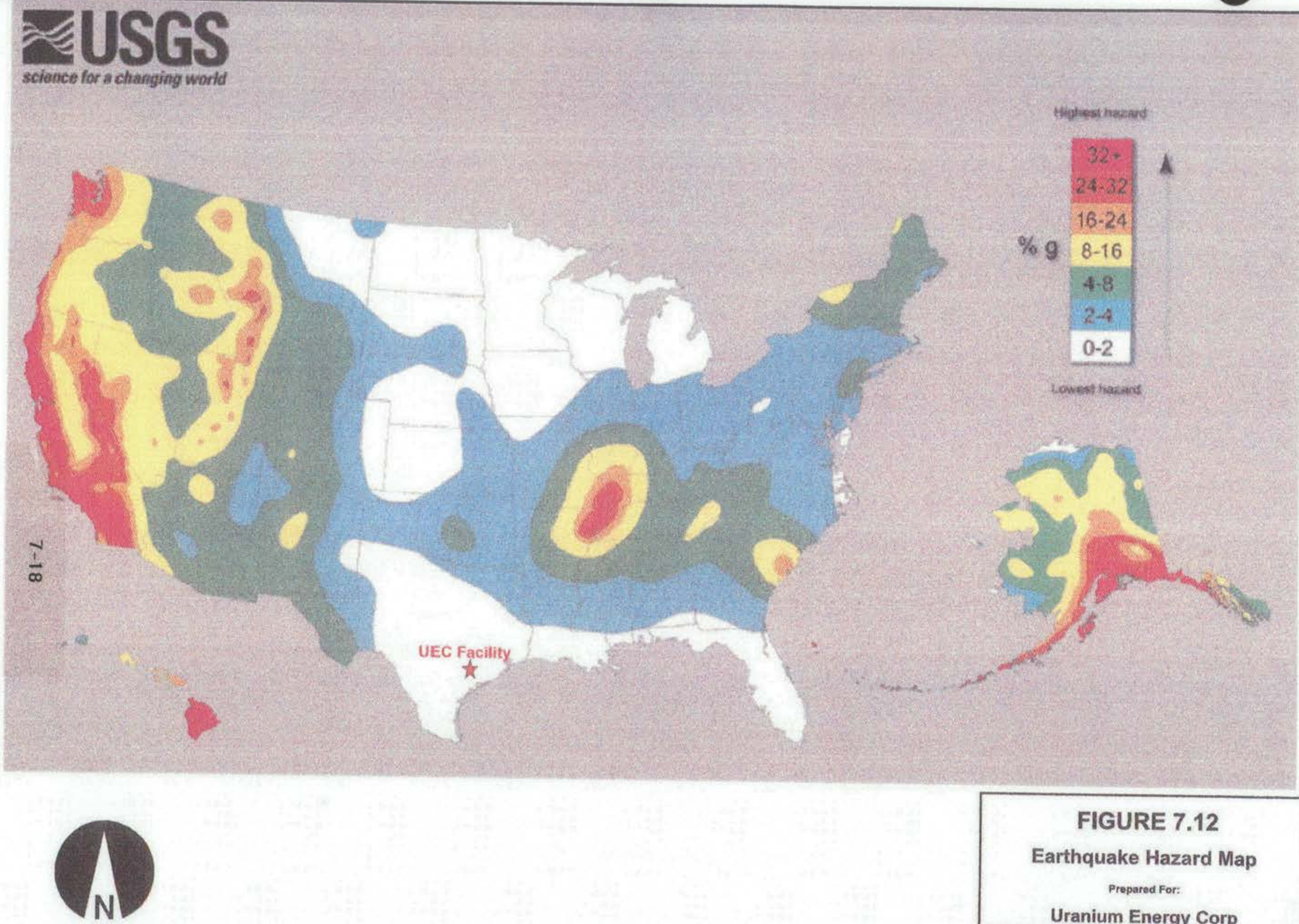

FIGURE 7.12	
Earthquake Hazard Map	
Prepared For:	
Uranium Energy Corp	
DRAWN BY: Weegar-Eide & Associates, LLC	DATE: 7/8/07
DRAWING NO: Fig 7-12.cdr	SCALE: Schematic: No Scale

Source: National Earthquake Information Center, 2007, Earthquake Hazard Map of the United States, neic.usgs.gov

7.2.1 Permit Area Stratigraphy and Lithology

Within the permit area, the Goliad Formation consists predominantly of fluvial facies, having a relatively high sand content (Figure 7-13). The up dip parts of the sand axes contain abundant amounts of coarse grained sand and gravel deposited by braided streams and grade down dip into meanderbelt deposits. Farther down dip, the fluvial system grades into deposits of a wave-dominated deltaic system. In general, the relict river systems to the north of the San Antonio River carried higher sand loads than the relict river systems to the south (Solis, 1981).

The Goliad Formation is approximately 400 feet thick in the permit area. As noted in Section 6.2, it is divided into four discrete sand units: Sand A, Sand B, Sand C, and Sand D. Each of the sand units, with the exception of Sand A in few places, is overlain and underlain by a relatively thick clay layer throughout the study area. Each of these sand units appears to constitute a discrete individual aquifer unit within the mine area and all are within the proposed aquifer exemption zone. Figures 6-8 through 6-13 are detailed strike and dip oriented cross-sections through the proposed permit area which show the stratigraphical, lithological, and structural relationships of the individual sand units. Figures 6.14 through 6.21 are maps showing the structural attitude and thickness of the individual sand units. In the proposed permit area, the Goliad Sand unconformably overlies the Lagarto Clay; however the basal sands of the Goliad are hard to distinguish from the sand beds within the upper portion of the Lagarto (Dale, et al., 1957). For the purpose of this study, the base of the Goliad is coincident with the base of Sand D (Figure 6.20).

Sand A is the uppermost sand unit in the permit area. As indicated on the cross-sections (Figures 6.8 through 6.13) and on the structure and isopach maps (Figures 6.14 and 6.15, respectively) the unit is pervasive throughout the permit area and thins and thickens in a sinuous pattern, characteristic of a fluvial depositional environment. The average depth to the base of Sand A is 99 feet BGL and the average thickness is 65 feet. (Table 6.1).

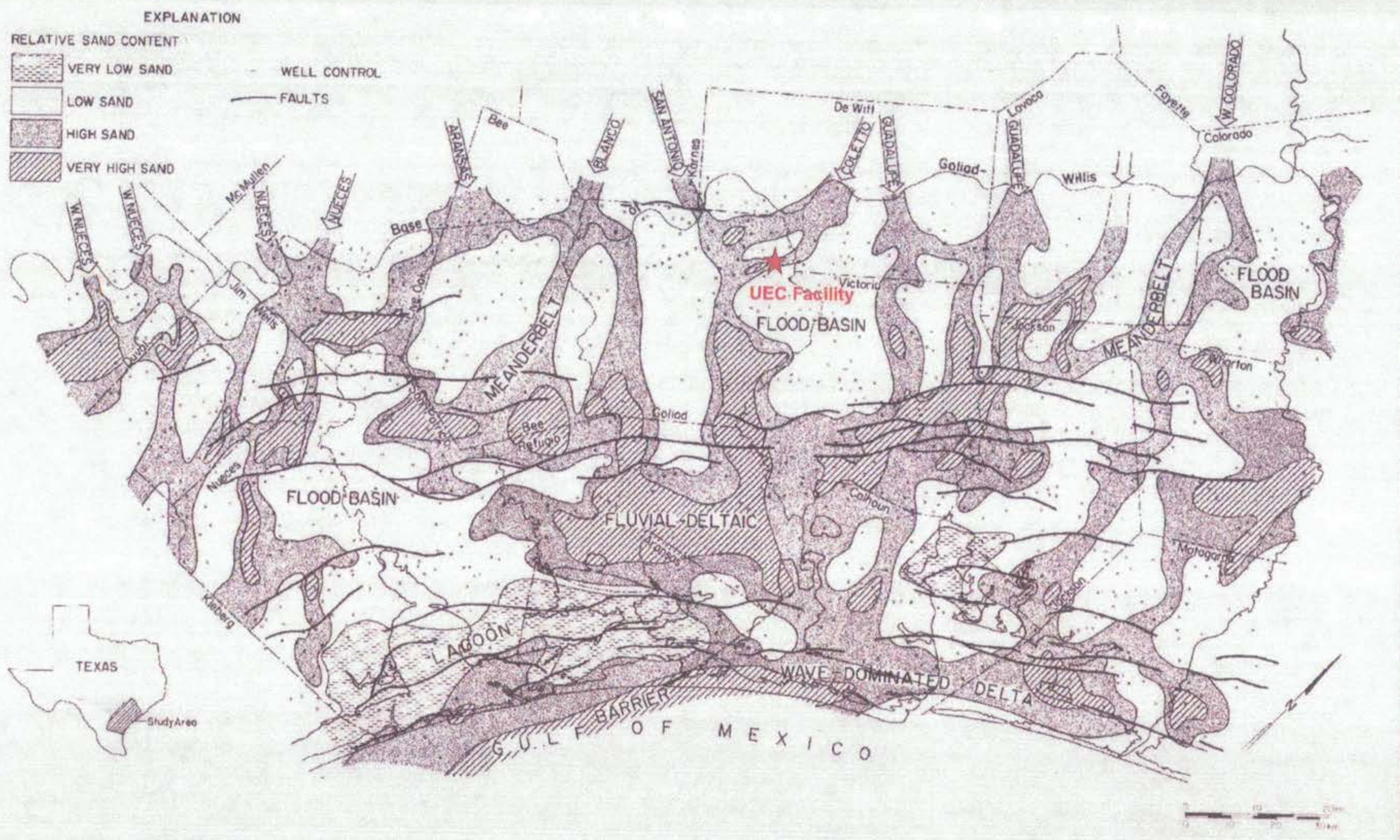

FIGURE 7.13

Depositional Systems and Relative Sand Content of the Goliad Formation

Prepared For:

Uranium Energy Corp

DRAWN BY:	DATE:
Weegar-Eide & Associates, LLC	7/19/07
DRAWING NO:	SCALE:
Fig 7-13.cdr	See Scale Bar

<u>Source</u>: Solis, R. F. I., 1981, Upper Tertiary and Quaternary Depositional Systems, Central Coastal Plain, Texas, Regional Geology of the Coastal Aquifer and Potential Liquid-Waste Repositories, The University of Texas at Austin, Bureau of Economic Geology, Report of Investigations No. 108, 89 pp.

Sand A is exposed at the surface in the central part of the permit area and no overlying clay is present. This uppermost surface is erosional in this area. As noted previously, this part of the site is not included in any production areas.

Sand B is the second sand unit in the permit area. Again, as noted previously, Sand B lies below Sand A and is isolated from Sand A by a clay barrier. As shown on cross-sections (Figure 6.8 through 6.13), and on the structure and isopach maps (Figures 6.16 and 6.17), the unit thins and thickens within the permit area in a sinuous pattern which is characteristic of a fluvial environment. The average depth to the base of Sand B is 181 feet BGL, and the average thickness is 36 feet.

Sand C is the third unit encountered below the surface in the permit area. As shown on the cross-sections (Figures 6.8 through 6.13) and on the structure and isopach maps (Figures 6.18 and 6.19, respectively) the unit is found in the western part of the permit area and peters out to the north and east. Where the unit is present, it thins and thickens in a sinuous pattern which is characteristic of a fluvial depositional environment. The average depth to the base of Sand C is 269 feet BGL and its average thickness is 36 feet.

Sand D is the fourth and lowermost sand unit encountered below the surface in the permit area. A review of the cross-sections (Figures 6.8 through 6.13) and the structure and isopach maps (Figures 6.20 and 6.21, respectively) show the unit is found throughout the permit area. As with the previously described sand units, Sand D thins and thickens in a sinuous pattern that is characteristic of a fluvial depositions environment. The average depth to the base of Sand D is 385 feet BGL and its average thickness is 80 feet.

The Lagarto Formation (aka Lagarto Clay) of the Fleming Group (Miocene) underlies the Goliad in the Permit Area and extends from the base of the Goliad to a depth of approximately 1600 feet BGL. The upper Lagarto looks very similar lithologically to the Goliad. In general, the upper part of the Lagarto is sandier than the middle and lower portions. The sands in the upper portion of the Lagarto are considered part of the

Evangeline Aquifer System, however the sands are separated from the overlying Goliad by relatively thick clay layers and probably constitute a discrete aquifer system comprising the first underlying aquifer. In general, the Lagarto is described as clay and sandy clay with intercalated beds of sand and sandstone (Dale, et al., 1957).

The Lagarto is underlain by the Oakville Sandstone (Fleming Group-Miocene). The Oakville unconformably overlies the Catahoula Tuff and crops out to the west and northwest of Goliad County. The Oakville consists of up to 700 feet of crossbedded sand and sandstone interbedded with lesser amounts of sandy, ashy, bentonitic clay. In general, the base of the Oakville marks the base of the USDW in the vicinity of the proposed UEC Permit Area.

7.2.2 Permit Area Structural Geology

As indicated on previously referenced cross-sections and project maps, two strike oriented (southwest to northeast) normal faults are present in the permit area. It appears that both faults are high angle since no fault cuts were readily discernible within the log data reviewed. However, the faults are mapped based on stratigraphic offset of correlative beds as indicated on the cross-sections. The fault in the northwest portion of the project area is downthrown on the south side of the fault and demonstrates variable offset but generally indicates approximately 100 feet of displacement at the top of the Sand A structural surface (Figure 6.14).

The fault in the southeast portion of the project area is downthrown on the north side of the fault and the two faults generally form a graben structure between them (Figure 6.12). The south fault also shows variable offset but generally about 60 feet of displacement at the top of the Sand A structural surface (Figure 6.14) is indicated.

References:

Barnes, V. E., 1975, Geologic Atlas of Texas, Beeville-Bay City Sheet, University of Texas at Austin, Bureau of Economic Geology (Revised in 1987).

Bebout, D. G., Weise, B. R., Gregory, A. R., and Edwards, M. B., 1982, Wilcox Sandstone Reservoirs in the Deep Subsurface Along the Texas Gulf Coast, Their Potential for Production of Geopressured Geothermal Energy, The University of Texas at Austin, Bureau of Economic Geology, Report of Investigations No. 117, 125 pp.

Chowdhury, A. H., and Turco, M. J., 2006, Geology of the Gulf Coast Aquifer, Texas, in Mace, R. E., et al., editors, Aquifers of the Gulf Coast of Texas, Texas Water Development Board Report 365, p 23-51.

Combs, J.M, 1993, The Vicksburg Formation of Texas; Depositional Systems Distribution, Sequence Stratigraphy, and Petroleum Geology, AAPG Bulletin v. 77, no. 11, p. 1942-1970.

Dale, O. C., Moulder, E. A., and Arnow, T., 1957, Groundwater Resources of Goliad County, Texas, Texas Board of Water Engineers Bulletin 5711, 93 pp.

Hamlin, H.S., 1988, Depositional and Ground-Water Flow Systems of the Carrizo-Upper Wilcox, South Texas, The University of Texas at Austin, Bureau of Economic Geology, Report of Investigations No. 175, 61 pp.

National Earthquake Information Center, 2007, (**neic**.usgs.gov/).

Salvador, A., 1991, Introduction, in Salvador, A., editor, The Gulf of Mexico Basin: Geological Society of America, The Geology of North America, vol. J, p 1-12.

Solis, R. F. I., 1981, Upper Tertiary and Quaternary Depositional Systems, Central Coastal Plain, Texas, Regional Geology of the Coastal Aquifer and Potential Liquid-Waste Repositories, The University of Texas at Austin, Bureau of Economic Geology, Report of Investigations No. 108, 89 pp.

Waters, J.A., McFarland, P.W., and Lea, J.W., 1955, Geologic Framework of Gulf Coastal Plain of Texas, AAPG Bulletin, v. 39, no. 9, p. 1821-1850.

Woodruff, C. M. Jr., Gever, C., Snyder, F. R., and Wuerch, D. R., 1983, Integration of Geothermal Data along the Balcones/Ouachita Trend, Central Texas, Report to U.S. Department of Energy, Division of Geothermal Energy, Under Contract No. DE-AS07-79ID 12057, 21pp., appendices, and plates.